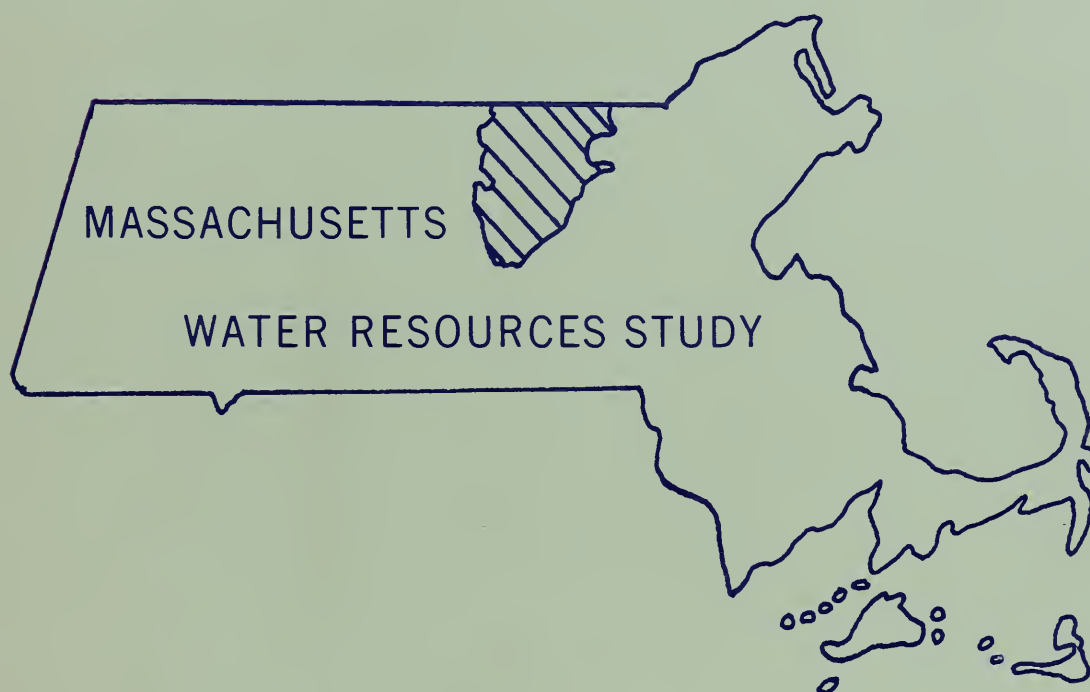


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INVENTORY of POTENTIAL and EXISTING UPSTREAM RESERVOIR SITES

NASHUA STUDY AREA
Massachusetts



U.S. DEPARTMENT of AGRICULTURE
Soil Conservation Service
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In cooperation with the

MASSACHUSETTS WATER RESOURCES COMMISSION

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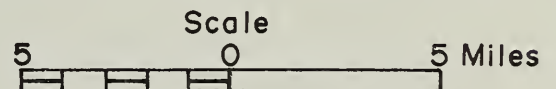
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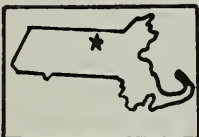
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LOCATION of SUB-WATERSHEDS
NASHUA STUDY AREA

MASSACHUSETTS



INVENTORY OF
POTENTIAL AND EXISTING UPSTREAM RESERVOIR SITES

in the
NASHUA STUDY AREA

Prepared by the
UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
in cooperation with the
MASSACHUSETTS WATER RESOURCES COMMISSION

INTRODUCTION

This report presents data on 220 potential and 69 existing reservoir sites in the Nashua Study Area, Worcester and Middlesex Counties. Detailed information and design summaries have been prepared for 137 of the potential sites.

DESCRIPTION OF STUDY AREA

The Nashua Study Area is located in north central Massachusetts in Worcester and Middlesex Counties. The Study Area includes all of the Nashua River Watershed in Massachusetts and the Massachusetts portion of the Souhegan River Watershed. Both the Nashua and Souhegan Rivers are tributaries to the Merrimack River.

The Souhegan flows into the Merrimack at Merrimack, New Hampshire, while the Nashua joins the Merrimack at Nashua, New Hampshire. The greater part of the Nashua River drainage area is in Massachusetts with a small portion in New Hampshire. The Souhegan is a New Hampshire watershed with only five per cent in Massachusetts.

The Study Area covers about 291,000 acres or 454 square miles and is divided into 11 subwatersheds. Portions of 27 cities and towns lie within the study area boundaries.

CRITERIA

Potential Reservoir Sites

The primary considerations used to identify potential reservoir sites were: suitable topography, a compact economical dam location, sufficient drainage area to maintain the proposed reservoir, and an undeveloped pool area.

The following criteria were used as a guide in site selection:

1. Drainage area -- larger than one half square mile, but not greater than 50 square miles.
2. Ratio of drainage area to potential beneficial pool surface -- not less than 10 to 1.
3. Minimum beneficial pool depth -- 7 feet at the dam.
4. Minimum beneficial pool area -- 10 acres.
5. Minimum beneficial pool capacity -- 100 acre feet.
6. Maximum beneficial pool capacity -- volume equal to 25 inches of runoff from the drainage area.
7. Maximum height of dam -- 100 feet.
8. Pool area relatively undeveloped -- no housing developments or major highways inundated.

Existing Reservoirs

Existing reservoirs were located using the USGS quadrangle sheets. Two criteria were used to determine sites to be included in this report:

1. Surface area -- at least 10 surface acres.
2. Man-made dam -- Natural ponds and beaver dams are excluded.

INVESTIGATIONS AND ANALYSES

Potential Reservoir Sites

Sites were located using the latest available U.S. Geological Survey 7½ minute quadrangle sheets. Natural basins, or topography favorable for storage of water, and an economical location for an embankment were the primary considerations in the initial site selection. Watershed boundaries were delineated on the quadrangle sheets and the drainage area was determined for each initial site selected. Water storage areas and volumes available upstream of the site centerline were calculated. Data were also obtained to calculate the volume of earth fill required for the dam and any supplementary dikes that might be needed to contain a reservoir.

At each potential site, an engineer made a field reconnaissance that included an inventory of land and facilities (man-made structures) that would be affected if a dam and reservoir were constructed on the site. If it was determined that the reservoir would flood extensive man-made

facilities; or a study of the elevation-area-storage data showed that the site did not meet criteria for the study, the site was dropped from further consideration. This report contains data which was developed for sites in this category with an explanation of why they were eliminated from further study. The sites which did not meet study criteria because of small drainage areas might be suitable as private developments for fire protection, stock water, recreation, etc.

A geologist made a surficial investigation of each potential site to determine any obvious geologic conditions that might affect the site's waterholding capability or require extensive foundation preparation. A preliminary geological report was prepared which outlined the types of materials which might be expected at the site and their effect on construction costs and waterholding capabilities for the site. The report of geologic conditions was based on the geologist's interpretation following the surficial investigation of the site and the surrounding area. No borings were made at any site and subsurface conditions may vary from those indicated in this report.

Hydrologic and hydraulic data were calculated using methods developed by the Soil Conservation Service. Rainfall data were obtained from Technical Paper 40 and 49, U. S. Department of Commerce, Weather Bureau.

Preliminary design calculations for several levels of development for each site were processed by electronic computer, using a program which determines the most economical type of principal spillway; determines the runoff and peak flow for the 100-year frequency, 10-day duration principal spillway design storm; routes the design storm to set the emergency spillway crest; performs other routings to determine the design high water and top of dam elevations; calculates embankment yardage and other construction quantities; determines the total estimated cost of the reservoir; and estimates "safe yield" for water supply purposes.

Existing Reservoirs

In addition to the potential site inventory, an inventory was made of 69 existing reservoirs that cover at least 10 surface acres and are formed by a man-made dam. The reservoirs were located using the USGS quadrangle sheets. A field reconnaissance was made to determine the physical condition of each structure and to assess the potential for expansion of the reservoir. While at the site, photographs were taken. The better photographs are included in this report. The ownership and use of many of the reservoirs were also obtained from records of the Worcester County Engineer and the Massachusetts Department of Public Works.

COSTS

Preliminary cost estimates for potential reservoir sites were based on costs and land values as of 1971. The cost estimates include: (1) construction costs; (2) contingencies; (3) engineering and administrative services necessary for surveys, geology, final design, and construction inspection; (4) cost for land required for the reservoir and construction of the dam and spillway; and (5) costs associated with the purchase or relocation of man-made facilities affected by the constructed reservoir.

Construction costs were based on recent dam construction contract costs in Massachusetts. A factor for contingencies, equal to 15% to 25% of the construction cost, was included to account for the cost of items that might not have been considered at this intensity of study. Engineering and administrative services ranged from 20% to 40% of the construction cost.

Costs for land acquisition were based on an evaluation of current real estate transactions and market conditions. Land with potential for development was valued at from \$1,000 to \$10,000 per acre; land with little development potential was valued at from \$200 to \$500 per acre. Land values also varied from site to site based on the proximity to developed areas and highways; development taking place in the area; and suitability for development. Land needed for the dam, spillway and design high water pool was included in the land acquisition cost.

Cost estimates are presented on the basis of a cost per-acre-foot of storage and cost per surface acre to provide a comparison between different sites and different levels of development at the same site. Costs are based on preliminary estimates; firm cost estimates for any site can be determined only after completion of detailed geologic and engineering investigations, final structural designs, and land appraisals.

No cost estimates are included for existing reservoirs.

REPORT CONTENTS

This report is divided into sections based on the eleven subwatersheds in the Nashua Study Area. A location map, placed after the "Table of Contents," outlines the area covered by each subwatershed. To aid local residents in determining which sites are located in their city or town, Appendix 1 contains a listing of municipalities within the study area and an index of the potential and existing sites and page numbers pertaining to that city or town.

Each subwatershed section provides "Site Data" for the potential and existing reservoir sites located within the subwatershed.

Potential Reservoir Sites

These site data include a location paragraph which contains a narrative description of the location of the site in reference to nearby roads, railroads, or other physical landmarks. In addition, the latitude, longitude and USGS quadrangle sheet name are provided to enable more accurate location.

Man-made facilities that would be flooded by a reservoir at the potential site are presented in the Facilities Affected paragraph of the site data. Several elevations were selected to cover the range of development which appear practical at the site. For each elevation, an inventory of the affected facilities is provided which indicates all of the improvements that would be flooded if the design high water from the reservoir were at the specified elevation. The elevation of existing facilities was estimated during the engineer's field reconnaissance with the aid of the USGS quadrangle sheets. The extent of road flooding was scaled from the quadrangle sheets. If the engineer assumed that a road would be closed, rather than relocated by the reservoir, the road is listed, but no length is indicated.

A summary of the preliminary geologic report is contained in the Geologic Conditions paragraph. The material in the abutments (the valley sides) and the foundation (the valley floor) is described. An estimate is made of the depth to bedrock and the probable type of rock. The availability of impervious fill material which would be used in the dam construction is noted.

Possible leakage problems are indicated and the waterholding capability of the site is subjectively described as "good," "fair," or "poor." The waterholding capability statement is based on the geologist's interpretation of the surficial conditions he has observed during the field reconnaissance.

Engineering Notes provide information which should be helpful in preliminary design of a dam. One of the abutments is recommended as the location for an excavated emergency spillway. The excavated spillway might be in earth or rock cut -- depending upon the depth to bedrock in the abutment. If an excavated emergency spillway is unable to carry the required flows at safe velocity, the need for a concrete emergency spillway is noted. If waterholding capability can be significantly improved with a practical cutoff through pervious abutment or foundation material, this fact is noted.

When it is known that some portion of a reservoir site is located on land owned by a governmental or quasi-public unit, the information is presented in a Public Ownership paragraph.

Some sites which did not meet all of the study criteria (usually because of drainage areas less than 0.5 square miles or extensive development) have been included in the report to present whatever limited information that may have been obtained and the reason that the potential site was eliminated from further study.

Potential sites which meet study criteria have been analyzed using a computer program which develops preliminary structure designs for several levels of beneficial pool. Results of the computer program are presented in the tables entitled Summary Data for Potential Upstream Reservoir Sites at the end of each subwatershed section. Two information lines contain data on site drainage area, USGS quadrangle name on which the site is located, latitude and longitude of the site, site rating, stream water quality, and principal spillway design storm runoff and peak flow. The site rating is based on the expected waterholding capability, existing facilities affected, geologic conditions, and stage-storage relationships. Sites are given one of the following ratings:

1. Suitable for deep permanent storage (over 10 feet in depth).
2. Best suited for shallow water storage (3 to 5 foot maximum depth).
3. Best suited for temporary storage (e.g., floodwater and sediment storage).

In order to furnish the most data for each potential reservoir site, each site was considered to be suitable for deep permanent storage (rating "1") for purposes of design and analyses. The rating for any site could change based on detailed geologic investigations.

Stream water quality ratings are based on classifications assigned by the Division of Water Pollution Control, Massachusetts Water Resources Commission, and published in Water Quality Standards, June 1967, and are as follows:

- "Class A -- Waters designated for use as public water supplied in accordance with Chapter 111 of the General Laws. Character uniformly excellent.
- "Class B -- Suitable for bathing and recreational purposes including water contact sports. Acceptable for public water supply with appropriate treatment.
Suitable for agricultural, and certain industrial cooling and process uses; excellent fish and wildlife habitat; excellent aesthetic value.
- "Class C -- Suitable for recreational boating; habitat for wildlife and common food and game fishes indigenous to the region; certain industrial cooling and process uses; under some conditions acceptable for public water supply with appropriate treatment.
Suitable for irrigation of crops used for consumption after cooking. Good aesthetic value.
- "Class D -- Suitable for aesthetic enjoyment, power, navigation, and certain industrial cooling and process uses. Class "D" waters will be assigned only where a higher water use class cannot be attained after all appropriate waste treatment methods are utilized."

The Summary Data for Potential Upstream Reservoir Sites tables also contain data for as many as six possible levels of development at each site. Elevations of the beneficial pool, emergency spillway crest, design high water, and top of dam are shown, along with pertinent storage volumes, surface areas and depths. Total cost expressed in dollars per acre foot of storage and dollars per surface acre are provided to aid in comparison of levels of development. The emergency spillway type which was used in the preliminary design is indicated by an emergency spillway type code and explained in the table notes.

These tables are photo-reductions of the computer output sheets. Elevations are shown to the tenth of a foot and costs to the nearest \$10.00, but are not to be considered that accurate because of the limited investigations made with preliminary data. All the Summary Data Tables are based on preliminary reconnaissance-type investigations and computer-produced structure designs. Additional detailed engineering, geologic and design investigations must be made before final site selection, land acquisition and final design would be practical.

Estimated safe yields for each potential reservoir are also shown on the tables and were based on information extrapolated from data developed by Professor G. R. Higgins, Civil Engineering Department, University of Mass., Amherst, Mass. These estimated safe yields are based on a 95% chance, or the minimum yield that could be expected 19 years out of 20 -- taking into consideration reservoir storage volume and expected runoff. These data do not consider evaporation, seepage, or prior upstream usage losses.

The Committee on Rainfall and Yield of Drainage Areas of the New England Water Works Association has recommended a figure of 600,000 gallons per day per square mile as a maximum economically feasible safe yield. Data for some of the potential sites in this report show a safe yield above 600,000 gallons per square mile per day; these higher values are useful to define the upper portion of a discharge-storage curve for preliminary analysis. For detailed evaluation of a potential site for water supply purposes, the recommendation of the New England Water Works Association should be considered.

Existing Reservoirs

Site data for existing reservoir sites are presented in a different format from the potential reservoir site data.

Location is indicated by reference to nearby roads, railroads or other physical landmarks. The appropriate USGS quadrangle sheet is indicated.

Physical data (surface area, height of dam, and drainage area) were estimated from the quadrangle sheet and by field reconnaissance.

Potential for Expansion of the existing reservoir is estimated and any major man-made facilities which would be affected by an enlarged reservoir are noted. In some instances, the drainage area of the reservoir does not meet the criteria requiring a 10 to 1 drainage area to pool area ratio, below which there may be relatively high evaporation losses. An increase in reservoir surface area might increase evaporation losses to a point where the reservoir could not be maintained during the summer months. These situations are indicated by the statement "Small drainage area may limit further expansion."

A description of the dam and any spillway system is included in the Remarks paragraph. Construction materials, spillway type and size, and condition of the structures are noted.

Public Ownership of the reservoir is noted, if applicable. Appendix 2 contains a list of existing sites and available information concerning apparent ownership and use of the reservoir.

Some existing reservoirs which did not meet the study criteria (10 acre minimum surface area and a man-made dam) have been included in the report to present whatever limited information that may have been obtained and the reason the site was eliminated from further study.

MAPS

Individual subwatershed maps appear at the end of each section which indicate the location of the potential and existing reservoir sites in that subwatershed. The maps are reductions of mosaics prepared from 7½ minute USGS quadrangle sheets (1" = 2000' scale). The quadrangle sheets used and published dates are listed on the maps. Potential sites which met study criteria and which have information in the tables are indicated with a solid blue rectangle surrounding the site number. The maximum beneficial pool (from the Structure Data Tables) is indicated by a large blue wave pattern. The drainage area which flows into these sites is indicated by green shading.

Potential sites for which complete data were not developed are identified by a dashed blue rectangle surrounding the site number. Only the center line of these sites is indicated. These are sites with drainage areas of less than 0.5 square miles or which flood extensive facilities. The sites were dropped from further study when it was determined that they did not meet study criteria.

Existing reservoir sites are identified by a blue diamond surrounding the site number and a small blue wave pattern over the existing surface area.

NASHUA STUDY AREA
SITE DATA FOR

Subwatershed NA-01, Souhegan River

The Massachusetts portion of the Souhegan River Watershed covers about 5,600 acres in the Towns of Ashburnham (Worcester County) and Ashby (Middlesex County).

The river originates in Massachusetts and flows northeasterly to Wilton, New Hampshire where it turns and flows nearly due east to its confluence with the Merrimack River. The Souhegan subwatershed was included in the Nashua Study Area, rather than the Merrimack, in an effort to maintain Study Areas as contiguous groupings of subwatersheds. Elevations in Massachusetts range from a high of about 1850 feet at Mount Wetatic to about 950 feet in the northern floodplain areas. Geology of the subwatershed could be characterized as schistose bedrock overlain from 10 to 25 feet of glacial till or englacial drift.

Nine potential reservoir sites and four existing reservoirs were studied. Summary tables are included for eight potential sites that met study criteria.

SITE NA-0101

Location: On South Brook approximately 600 feet southwest of the junction of Route 119 and Flint Street in Ashby, Massachusetts.

Ashby, Massachusetts-New Hampshire Quadrangle

Latitude: 42°41'02" Longitude: 71°51'46"

Facilities

Affected:

Below Elevation 1100

13 houses
2 trailers
21 cottages
1 small business
14 miscellaneous buildings
525 feet of Rindge Road
1325 feet of Fitchburg Road
Old Ashby Road

Below Elevation 1090

2 houses
Old Ashby Road

Below Elevation 1080

1 house
Old Ashby Road

Below Elevation 1095

4 houses
Old Ashby Road

SITE NA-0101 (Cont'd)

Geologic
Conditions:

Both abutments are schistose bedrock overlain by thin discontinuous englacial drift -- shallow to bedrock. Depth to bedrock in foundation not known, but may be within 5-10 feet. There are no apparent leakage problems. Impervious borrow material for dam construction was not located on site. Water-holding capabilities appear good.

Engineering
Notes:

The recommended location for an excavated emergency spillway is at the right abutment. Preliminary structure designs indicate that a concrete chute spillway may also be needed at this site to avoid excessive velocity in the excavated spillway.

SITE NA-0102

Location:

On South Brook approximately 350 feet upstream from the Massachusetts-New Hampshire boundary in Ashby, Massachusetts.

Ashby, Massachusetts-New Hampshire Quadrangle

Latitude: 42°42'33"

Longitude: 71°51'09"

Facilities
Affected:

<u>Below Elevation 1040</u>	<u>Below Elevation 1030</u>
8 houses	2 houses
1 Townshed Complex	750 feet of West Road
400 feet of Jewett Hill Road	Jones Hill Road
1100 feet of Breed Road	
2000 feet of West Road	<u>Below Elevation 1015</u>
Jones Hill Road	100 feet of West Road
	Jones Hill Road
<u>Below Elevation 1035</u>	
8 houses	<u>Below Elevation 1005</u>
1 Townshed Complex	900 feet of Jones Hill Road
1400 feet of West Road	
Jones Hill Road	<u>Below Elevation 990</u>
	200 feet of Jones Hill Road

SITE NA-0102 (Cont'd)

Geologic
Conditions:

Right abutment consists of floodplain deposits at lower elevations and glacial till or englacial drift on higher elevations - shallow to bedrock. Depth to schist bedrock in foundation not known, but probably 15-25 feet. There are leakage problems in both abutments and foundation. Impervious borrow material for dam construction is available on site; however, rock greater than 6-inches may run 30 percent. Waterholding capabilities appear fair.

Engineering
Notes:

The recommended location for an excavated emergency spillway is at the right abutment. Waterholding capabilities may be improved if a positive cutoff can be made. Preliminary designs indicate that a concrete emergency spillway (either a chute or monolithic conduit) will be required to avoid excessive velocity on the excavated emergency spillway.

Public
Ownership:

About 20 acres are on Boy Scout Camp land.

SITE NA-0103

Location:

On an unnamed tributary to South Brook approximately 1200 feet upstream from West Road in Ashby, Massachusetts.

Ashby, Massachusetts-New Hampshire Quadrangle

Latitude: 42°42'28" Longitude: 71°51'54"

Facilities
Affected:

<u>Below Elevation 1070</u>	<u>Below Elevation 1060</u>
2 houses	1 house
1 garage	1360 feet of Bennett Road
1600 feet of Bennett Road	
1500 feet of Pillsbury Road	
<u>Below Elevation 1065</u>	<u>Below Elevation 1050</u>
1 house	300 feet of Bennett Road
1 garage	
1500 feet of Bennett Road	

SITE NA-0103 (Cont'd)

Geologic

Conditions:

Right abutment is outwash sand and gravel - shallow to bedrock or glacial till. Left abutment is englacial drift with cobbles and boulders - shallow to bedrock. Depth to schist bedrock in foundation not known, but may be 15-25 feet. There are leakage problems in both abutments and in the foundation. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear fair to poor.

Engineering

Notes:

The recommended location for an emergency spillway is at the right abutment. Waterholding capabilities may be improved if a positive cutoff can be made.

SITE NA-0104

Location

On an unnamed tributary to Ward Pond at junction of Old Ashby Road and Marble Road in Ashburnham, Massachusetts.

Ashburnham, Massachusetts-New Hampshire Quad.

Latitude: 42°40'31" Longitude: 71°53'02"

Facilities

Affected:

<u>Below Elevation 1125</u>	<u>Below Elevation 1120</u>
2 houses	450 feet of Ashby Road
1100 feet of Ashby Road	1500 feet of Old Ashby Road
1500 feet of Old Ashby Road	

Geologic

Conditions:

Both abutments are outwash sand and gravel and silty sand and gravel. Right abutment is glacial till at higher elevation. Depth to bedrock in foundation is not known. There are leakage problems in both abutments and possibly in the foundation. Impervious borrow material for dam construction is available on site; however, there are some cobbles and boulders present. Waterholding capabilities appear fair to poor.

Engineering

Notes:

The recommended location for an emergency spillway is at the right abutment. Waterholding capabilities may be improved if a positive cutoff can be made.

Public

Ownership:

A small area north of Old Marble Road is in the Ashburnham State Forest.

SITE NA-0105

Location: On an unnamed tributary to Marble Pond near
junction of Rindge Turnpike and Wagg Road in
Ashburnham, Massachusetts.
Ashby, Massachusetts-New Hampshire Quadrangle
Latitude: 42°40'09" Longitude: 71°52'16"

Facilities
Affected:

Below Elevation 1220
1200 feet of Fitchburg Road
Wagg Road
Private Road

Below Elevation 1205
500 feet of Fitchburg Road

Geologic
Conditions:

Both abutments are silty sand and gravel, shallow
to schist bedrock. Depth to bedrock in foundation
not known, but may be 10-15 feet. There are no
apparent leakage problems. Impervious borrow
material for dam construction was not located on
site. Waterholding capabilities appear to be good.

Engineering
Notes:

The emergency spillway will probably be in schist
bedrock.

SITE NA-0106

Location: On tributary to Stodge Meadow Pond approximately
300 feet upstream from road which runs along
East Bank of pond in Ashburnham, Massachusetts
Ashburnham, Massachusetts Quadrangle
Latitude: 42°41'02" Longitude: 71°51'46"

Remarks:

This site did not meet criteria for this study due
to the small contributing drainage area, (189 acres);
therefore, no further investigations were made.

SITE NA-0107

Location: On South Brook approximately 350 feet upstream
from Jones Hill Road in Ashby, Massachusetts
Ashby, Massachusetts-New Hampshire Quadrangle
Latitude: 42°42'11" Longitude: 71°51'12"

Facilities

Affected:	<u>Below Elevation 1040</u>	<u>Below Elevation 1030</u>
	8 houses	2 houses
	Town Garages	750 feet of West Road
	2000 feet of West Road	
	1111 feet of Breed Road	Below Elevation 1015
	400 feet of Jewett Hill Road	100 feet of West Road
	gravel Pit	
	<u>Below Elevation 1035</u>	
	8 houses	
	Town Garages	
	1400 feet of West Road	

Geologic

Conditions: The right abutment is floodplain deposits at lower elevations and glacial till on higher elevations - shallow to bedrock. Left abutment is ice contact sand and gravel - shallow to bedrock. Depth to bedrock in foundation not known, but may be schist at 15-25 feet. Impervious borrow material for dam construction is available on site; however, rock size greater than 6 inches may run 30 percent. Waterholding capabilities appear to be fair.

Engineering

Notes: Waterholding capabilities may be improved if a positive cutoff can be made. The recommended location for an excavated emergency spillway is at the right abutment. Preliminary structure designs, indicate that a concrete emergency spillway (either a chute or monolithic conduit) will be required to avoid excessive velocity in an excavated spillway.

Public

Ownership: About 5 acres are on Boy Scout Camp land

SITE NA-0108

Location: On an unnamed tributary to South Brook approximately 2500 feet upstream from Bennett Road in Ashby, Massachusetts. Ashburnham, Massachusetts-New Hampshire Quadrangle.

Latitude: 42°42'19" Longitude: 71°53'01"

Facilities Affected: No facilities affected below Elevation 1230.

Geologic Conditions: The right abutment is glacial till near the toe of slope, underlain by schist bedrock. There is bedrock higher on the abutment. The left abutment is silty sand, glacial till. Depth to bedrock in foundation is not known, but may be 15-25 feet. There are no apparent leakage problems. Impervious borrow material for dam construction is available on site; however, rock greater than 6 inches may run 15 percent. Waterholding capabilities appear good.

Engineering Notes: The recommended location for an excavated emergency spillway is at the left abutment.

SITE NA-0109

Location: On an unnamed tributary to Ward Pond approximately 350 feet upstream from Route 101 (Ashby Road) in Ashburnham, Massachusetts. Ashburnham, Massachusetts-New Hampshire Quadrangle.

Latitude: 42°41'02" Longitude: 71°53'09"

Facilities Affected: No facilities affected below Elevation 1165.

Geologic Conditions: Both abutments are englacial drift sand and gravel with cobbles and boulders. Depth to bedrock not known, but probably schistose at 10-15 feet. There are no apparent leakage problems. Impervious borrow material for dam construction is available on site; however, rock size greater than 6 inches may run 30 percent. Waterholding capabilities appear to be good.

Engineering Notes: The recommended location for an emergency spillway is at the right abutment.

Public Ownership: A very small area is in the Ashburnham State Forest.

NA-0110 -- MARBLE POND

Location: North of Stodge Meadow Pond in
Ashburnham, Massachusetts
Ashburnham, Massachusetts Quadrangle

<u>Surface Area</u> <u>(Acres)</u>	<u>Height of</u> <u>Dam (Ft.)</u>	<u>Drainage Area</u> <u>(Acres)</u>	<u>(Sq. Mi.)</u>
17	10	1080	1.69

Potential
for
Expansion:

It appears that the pond could be raised about 15 feet to the level of Stodge Meadow Pond with a new dam.

Remarks:

This is an old stone mill dam with a building over the structure. Stone work is in poor condition.



NA-0111 -- WARD POND

Location: Upstream of Rindge Turnpike in Ashburnham,
Massachusetts.

Ashburnham, Massachusetts Quadrangle

<u>Surface Area</u> <u>(Acres)</u>	<u>Drainage Areas</u> <u>(Acres)</u>	<u>(Sq. Mi.)</u>
49	2390	3.73

Remarks: Ward Pond appears to be a natural depression
rather than a man-made pond. No photographs
were taken.

NA-0112 -- STODGE MEADOW POND

Location: Near Hay Road in Ashburnham, Massachusetts

Ashburnham, Massachusetts Quadrangle.

<u>Surface Area</u> <u>(Acres)</u>	<u>Drainage Areas</u> <u>(Acres)</u>	<u>(Sq. Mi.)</u>
126	570	0.88

Remarks: Stodge Meadow Pond has no dam. No photos
were taken.

NA-0113 -- WATATIC POND

Location: On the Ashby-Ashburnham town line near Route 119

Ashby, Massachusetts Quadrangle.

<u>Surface Area</u> <u>(Acres)</u>	<u>Drainage Areas</u> <u>(Acres)</u>	<u>(Sq. Mi.)</u>
21	2630	4.10

Remarks: Watatic Pond has no dam. No photos were taken.

SUMMARY DATA FOR POTENTIAL UPSTREAM RESERVOIR SITES

STUDY AREA-NASHUA RIVER										SUBWATERSHED-SOUHEGAN RIVER									
BENEFICIAL POOL										EMERGENCY SPILLWAY									

SUMMARY DATA FOR POTENTIAL UPSTREAM RESERVOIR SITES

STUDY AREA-NASHUA RIVER

SUBWATERSHED-SOUHEGAN RIVER

BENEFICIAL POOL

EMERGENCY SPILLWAY

DESIGN

DAM

SAFE

YIELD

ELEV	STORAGE	COST	PER	AREA	SURF	COST/	DEPTH	AT	CREST	STORAGE	COST	PER	ELEV	AREA	ELEV	TOP	FILL	PERCENT
(MSL)	AC FT	IN	AC FT	IN	AC FT	IN	AC FT	IN	AC FT	IN	AC FT	IN	AC FT	IN	AC FT	IN	CY	CHANCE
NA-0104	DA= 0.70	SQ MI = 448	AC	USGS QUAD- ASHBURNHAM MASS-NH	100-YR PRIN SPY DESIGN STORM	RUNOFF = 8.20	IN. PEAK FLOW = 124	CFS										
SITE RATING (3)																		

1103.1	0	0.0	6	1.1	1109.6	E	155	4.1	11010	*	1111.9	50	*	1114.6	13	8	*	0.18	
1108.1	100	2.7	17440	33	53150		6.1	1110.6	E	202	5.4	8630	*	1113.0	55	*	1115.3	9	0.33
1112.1	267	7.1	6770	51	35120		10.2	1114.6	E	416	11.1	4340	*	1116.8	71	*	1119.9	17	0.46
1116.3	517	13.7	3610	69	27110		14.2	1118.8	E	706	18.9	2640	*	1120.1	85	*	1123.1	24	0.56
1120.6	850	22.7	2300	87	22420		18.6	1123.1	E	1089	29.2	1800	*	1123.8	102	*	1126.6	34	0.58
1121.5	933	25.0	2120	92	21580		19.5	1124.0	E	1184	31.7	1670	*	1124.6	106	*	1127.4	36	0.58

NA-0105	DA= 0.50 SQ MI = 320 AC USGS QUAD-ASHBY MASS-NH LATITUDE 42-40-09 LONGITUDE 71-52-18																					
SITE RATING (1)	STREAM WATER QUALITY (8) 100-YR PRIN SPWY DESIGN STORM RUNOFF = 8.20 IN. PEAK FLOW = 88 CFS																					
1193.4	0	0.0	4	1.4	*	1201.3	E	111	4.1	3820	*	1203.6	28	*	1206.4	14	9	*				
1201.0	100	3.8	4730	22	21120		9.0	*	1203.5	E	167	6.1	2840	*	1205.8	33	*	1208.1	16	12	*	0.17
1205.0	204	7.6	2630	31	17520		13.0	*	1207.5	E	291	10.8	1850	*	1209.6	41	*	1212.0	20	21	*	0.25
1208.0	308	11.6	1950	37	16180		16.0	*	1210.5	E	412	15.5	1460	*	1212.6	47	*	1215.6	24	35	*	0.30
1211.8	465	17.4	1430	45	14650		19.7	*	1214.3	E	589	22.1	1130	*	1215.9	55	*	1218.8	27	49	*	0.36
1212.5	496	18.6	1370	47	14470		20.5	*	1215.0	E	625	23.4	1090	*	1216.5	56	*	1219.3	27	53	*	0.37

NA-0107	DA= 6.30 SQ MI = 4032 AC USGS QUAD- ASHBY MASS-NH																		LATITUDE 42-42-11		LONGITUDE 71-51-12	
SITE RATING (2)	STREAM WATER QUALITY (B) 100-YR PRIN SPWY DESIGN STORM																		RUNOFF = 8.20 IN, PEAK FLOW =		858 CFS	
992.8	0	0.0	13	5.8	* 1031.5	E	2169	6.5	830	*	1033.9	139	*	1038.9	52	268	*	0.39				
999.0	100	0.3	13250	21	63890		12.0	*	999.0	T	150	0.4	8810	*	1010.0	51	*	1012.5	26	1.33		
1012.0	597	1.7	2950	54	32460		25.0	*	1012.0	T	648	1.9	2720	*	1026.9	94	*	1030.3	43	2.17		
1023.5	1343	4.0	1700	80	28520		36.5	*	1023.5	T	1394	4.1	1640	*	1036.4	160	*	1039.6	53	2.87		
1032.5	2245	6.6	1030	127	18230		45.5	*	1032.5	T	2295	6.8	1010	*	1037.8	172	*	1039.9	53	2.87		

NOTES - (1) COSTS ARE BASED ON 1971 S.C.S. DESIGN CRITERIA AND COST DATA.
 (2) EMERGENCY SPILLWAY STORAGE AND COSTS ARE BASED ON TOTAL STORAGE, INCLUDING BENEFICIAL POOL.
 (3) EMERGENCY SPILLWAY TYPE CODE- C=CONCRETE CHUTE, D=CONCRETE DROP, E=EXCAVATED, T= TWO SPILLWAYS, N= NONE
 (4) TABULAR DATA ARE BASED ON PRELIMINARY INFORMATION. FIGURES SHOWN ARE PRIMARILY FOR COMPARISON PURPOSES.
 (5) ELEVATIONS ARE SHOWN TO THE NEAREST 0.1 FOOT TO SHOW VARIATION BETWEEN DEVELOPMENTS ONLY, AND ARE NOT TO BE CONSIDERED ACCURATE TO THAT DEGREE.

** DO NOT USE FOR FINAL SITE SELECTION OR LAND ACQUISITION. **

SUMMARY DATA FOR POTENTIAL UPSTREAM RESERVOIR SITES

STUDY AREA-NASHUA RIVER										SUBWATERSHED-SOUHEGAN RIVER									
BENEFICIAL POOL										EMERGENCY SPILLWAY									

-20-

Notes



SOURCE-USGS QUAD. SHEETS
ASHBURNHAM-1965
ASHBY-1965

SOUHEGAN RIVER (NA-1)
NASHUA STUDY AREA
MASSACHUSETTS

EXISTING AND POTENTIAL RESERVOIR SITES
UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

NASHUA STUDY AREA
SITE DATA FOR

Subwatershed NA-2, North Nashua River

This subwatershed covers about 36,500 acres in Ashburnham, Westminster, Gardner, Princeton, Leominster and Fitchburg; all in Worcester County.

The main stream is the Whitman River which forms in the hills of Ashburnham around Lake Wampanoag and flows southeasterly through Westminster to Snows Mill Pond in Fitchburg before it joins the North Nashua River. Elevations vary from about 1900 feet in the extreme northern and southern sections to about 500 feet in the downstream areas of Fitchburg. Geology within the subwatershed is predominantly schist bedrock at depths of 10 to 40 feet, overlain by glacial till or englacial drift.

Twenty seven potential reservoir sites and 17 existing reservoirs were studied. Summary tables are included for 17 potential sites that met study criteria.

SITE NA-0201

Location: On a tributary to Hobbys Pond approximately
1400 feet east of Howe Hill in Gardner,
Massachusetts.
Gardner, Massachusetts Quadrangle
Latitude: 42°36'03" Longitude: 71°58'27"

Remarks: This site did not meet criteria for this study
due to the small contributing drainage area, (223 acres)
Therefore, no further investigations were made.

SITE NA-0202

Location: On an unnamed tributary to South Ashburnham Reservoir, approximately 2800 feet upstream from Route 101 (Central Street), in Ashburnham, Massachusetts.

Ashburnham, Massachusetts-New Hampshire Quadrangle
Latitude: 42°37'49" Longitude: 71°55'48"

Facilities

Affected: No facilities affected below Elevation 1105

Geologic

Conditions: The left abutment is sand and gravel underlain by silty sand and gravel, glacial till. The right abutment is sand and gravel outwash, swamp and silty sand and gravel glacial till. Depth to bedrock in foundation is not known, but may be 15-25 feet to schist. There are leakage problems in both abutments. Impervious borrow material for dam construction is available on site; however, rock size greater than 6 inches may run 20 percent. Waterholding capabilities appear poor.

Engineering

Notes: The recommended location for an emergency spillway is at the left abutment. Waterholding capabilities may be improved if a cutoff to till can be made.

SITE NA-0203

Location: On Phillips Brook 500 feet upstream of Factory Village Pond in Ashburnham, Massachusetts

Ashburnham, Massachusetts-New Hampshire Quadrangle

Latitude: 42°37'44" Longitude: 71°53'44"

Facilities

Affected: No facilities affected below Elevation 960

Geologic

Conditions: The right abutment is silty sand and gravel englacial drift - shallow to schist bedrock. The left abutment is outwash sand and gravel. Depth to bedrock in foundation is not known, but may be 35 feet to schist bedrock. There is a leakage problem in the left abutment in outwash terrace. Impervious borrow material for dam construction is available on site. Waterholding capabilities appear good if terrace on left abutment can be cut off.

SITE NA-0203 (Cont'd)

Engineering
Notes:

The recommended location for an excavated emergency spillway is at the left abutment. Preliminary structure designs indicate that a concrete chute spillway will probably be required to avoid excessive velocity in an excavated emergency spillway.

SITE NA-0204

Location:

On Brown Brook approximately 4,000 feet upstream from Route 12 (Fitchburg Road) in Ashburnham, Massachusetts.

Ashburnham, Massachusetts-New Hampshire Quadrangle

Latitude: 42°38'16" Longitude: 71°52'58"

Facilities
Affected:

<u>Below Elevation 1090</u>	<u>Below Elevation 1070</u>
2 houses	1 house
1 barn	1200 feet of Russell
2500 feet of Russell Hill Road	Hill Road
<u>Below Elevation 1080</u>	<u>Below Elevation 1065</u>
2 houses	700 feet of Russell
1 barn	Hill Road
1550 feet of Russell Hill Road	

Geologic
Conditions:

Both abutments are thin englacial drift underlain by schist bedrock. Depth to bedrock in foundation is not known, but may be 15 to 25 feet to schist. There are no apparent leakage problems, but there is a possible leakage problem in the low terrace on the right abutment. Impervious borrow material for dam construction is available on site. Waterholding capabilities appear to be good.

Engineering
Notes:

The recommended location for an emergency spillway is at the left abutment.

SITE NA-0205

Location: On unnamed tributary to Phillips Brook
approximately 2,600 feet upstream from
Dean Hill Road on Ashburnham-Westminster
Town Boundary.
Ashby, Massachusetts-New Hampshire Quadrangle
Latitude: 42°37'30" Longitude: 71°52'08"

Facilities
Affected: Below Elevation 1000
600 feet of unnamed road off Jewell Hill Road

Geologic
Conditions: Both abutments are silty sand and gravel,
glacial till. There may be some englacial
drift - shallow to schist bedrock on the right
abutment. Depth to schist bedrock in founda-
tion is not known, but may be 15 to 25 feet.
There are no apparent leakage problems.
Impervious borrow material for dam construction
is available on site, but contains cobbles and
boulders. Waterholding capabilities appear good.

Engineering
Notes: The recommended location for an emergency spillway
is at the right abutment.

SITE NA-0206

Location: On Phillips Brook in Westminster, Massachusetts
about 1900 feet downstream of Smith Road
Fitchburg, Massachusetts Quadrangle
Latitude: 42°36'08" Longitude: 71°52'00"

Remarks: This is the Nookagee Site proposed in the
Corps of Engineers North Nashua Study.
For further information on this site see:
"Water Resource Development Plan -- North
Nashua River Basin", U.S. Army Engineer
Division, New England Corps of Engineers,
Waltham, Massachusetts, January 1965.
Site topography, costs, etc., are presented in
the appendices of the Corps report.

SITE NA-0207

Location: On a tributary to Phillips Brook approxi-
mately 1,250 feet upstream from Bean Hill
Road in Westminster, Massachusetts
Fitchburg, Massachusetts Quadrangle
Latitude: 42°35'33" Longitude: 71°52'17"

Engineering
Notes: Drainage Area - 386 acres -- This site does not
meet criteria for this study. At the
maximum feasible pool elevation, the depth at
the dam is less than 7 feet and storage is less
than 100 acre-feet; therefore, no further investi-
gations were made.

SITE NA-0208

Location: On Phillips Brook in Fitchburg, Massachusetts,
about 2,500 feet upstream of Westminster Hill Road.
Fitchburg, Massachusetts Quadrangle
Latitude: 42°34'52" Longitude: 71°50'52"

Remarks: This is the Phillips Dam proposed in the Army
Corps of Engineers North Nashua Study.
For further information on this site see:
"Water Resource Development Plan - North Nashua
River Basin", U.S. Army Engineer Division, New
England Corps of Engineers, Waltham, Massachusetts,
January 1965.
Site topography, costs, etc. are presented in
the Appendices to the Corps' report.

SITE NA-0209

Location: On an unnamed tributary to Whitman River approximately 900 feet upstream from Boston and Maine Railroad in Gardner, Massachusetts.

Gardner, Massachusetts Quadrangle

Latitude: $42^{\circ}35'08''$ Longitude: $71^{\circ}56'42''$

Geologic
Conditions:

Both abutments are silty sand, glacial till. Depth to schist bedrock unknown, but may be 30 to 40 feet. There are no apparent leakage problems. Impervious borrow material for dam construction is available on site, but contains gravel and cobbles. Waterholding capabilities appear to be good.

Engineering
Notes:

This site does not meet the criteria for this study. With maximum top of dam elevation at 1100 and maximum normal pool at 1090, there are less than 100 acre feet of storage and less than 7 feet of depth at the dam, therefore no design summaries were made.

The recommended location for an emergency spillway is at the left abutment.

SITE NA-0210

Location: On an unnamed tributary to Whitman River approximately 200 feet upstream from Overlook Road in Westminster, Massachusetts.

Gardner, Massachusetts Quadrangle

Latitude: $42^{\circ}34'18''$ Longitude: $71^{\circ}55'20''$

Facilities
Affected:

Below Elevation 1040
1500 feet of Beech Hill Road

Below Elevation 1025
200 feet of Beech Hill Road

Below Elevation 1035
550 feet of Beech Hill Road

SITE NA-0210 (Cont'd)

Geologic
Conditions:

Both abutments are silty sand or gravel including the dike, and probably shallow to schist bedrock. Depth to schist bedrock in foundation is unknown, but may be 15 to 25 feet. There are no apparent leakage problems. Impervious borrow material for dam construction is available on site; however, rock greater than 6-inches may run 25 percent. Waterholding capabilities appear to be good.

Engineering
Notes:

The recommended location for an emergency spillway is at the right abutment.

SITE NA-0211

Location:

On a tributary to Whitman River approximately 3,200 feet from Ashburnham Road in Westminster, Massachusetts.

Gardner, Massachusetts Quadrangle

Latitude: $42^{\circ}35'21''$ Longitude: $71^{\circ}53'30''$

Engineering
Notes:

This site does not meet criteria for this study due to the small contributing drainage area. (259 acres), therefore no further investigations were made.

SITE NA-0212

Location:

On Whitman River approximately 1900 feet upstream from junction of Ashburnham Road and Route 2A in Westminster, Massachusetts.

Fitchburg, Massachusetts Quadrangle

Latitude: $42^{\circ}33'43''$ Longitude: $71^{\circ}52'25''$

Facilities
Affected:

No facilities affected below Elevation 700.

SITE NA-0212 (Cont'd)

Geologic
Conditions:

The left abutment is thin sand and gravel underlain by dense glacial till. The right abutment is outwash sand and gravel. Depth to schist bedrock in foundation is not known, but may be 15 to 20 feet. There is a leakage problem in the right abutment. Impervious borrow material for dam construction is available on site; however rock greater than 6 inches may run 30 percent. Waterholding capabilities appear poor.

Engineering
Notes:

The recommended location for an emergency spillway is at the left abutment. Waterholding capabilities may be improved if a positive cut-off can be made. No further investigations were made at this site. Storage potential is poor for the large structure drainage area.

SITE NA-0213

Location:

At outlet end of Burnt Mill Pond in Westminster, Massachusetts.

Gardner, Massachusetts Quadrangle

Latitude: 42°32'50" Longitude: 71°55'58"

Facilities

Affected:

Below Elevation 1110

11 houses

1 garage

1 shop

450 feet of Ellis Road

Below elevation 1105

1 house

1 shop

300 feet of Ellis Road

Geologic
Conditions:

The left abutment is silty sand or gravel, glacial till. The right abutment is outwash sand and gravel. Depth to schist bedrock in foundation is not known, but may be 30 to 40 feet. There is a leakage problem in the right abutment. Impervious borrow material for dam construction is available on the left abutment, but will be rocky. Waterholding capabilities appear poor.

Engineering
Notes:

The recommended location for an emergency spillway is at the right abutment. See existing site data for Burnt Mill Pond; (page 29).

Public
Ownership:

About 1% of the area is owned by the Massachusetts Department of Natural Resources.

NA-0213 -- BURNT MILL POND

Location: 1300 feet upstream of Route 140
in Westminster, Massachusetts.
Gardner, Massachusetts USGS Quadrangle

<u>Surface Area</u> (Acres)	<u>Height of Dam</u> (Ft.)	<u>Drainage Area</u> (Acres)	<u>Sq. Mi.)</u>
20	6	710	1.12

Potential
for
Expansion:

This site has expansion potential if a new dam is constructed. See potential site narrative and summary tables.

Remarks:

This is a low earth-fill dam with two concrete spillways. The dam has trees and brush growing along the top and downstream slope. Dam has very little freeboard and is in poor condition.

SITE NA-0214

Location: On a stream tributary to Wyman Pond approximately 200 feet upstream from Worcester Road in Westminister, Massachusetts.

Gardner, Massachusetts Quadrangle

Latitude: $42^{\circ}31'38''$ Longitude: $71^{\circ}53'42''$

Facilities
Affected:

No facilities affected below Elevation 950

Geologic
Conditions:

Both abutments are silty sand and gravel, glacial till. Depth to schist bedrock in the foundation is not known, but may be 10 to 15 feet. There are no apparent leakage problems. Impervious borrow material for dam construction is available on site; however, rock greater than 6 inches may run 20 percent. Waterholding capabilities appear to be good.

Engineering
Notes:

The recommended location for an excavated emergency spillway is at the right abutment. Preliminary structure designs indicate that a concrete emergency spillway (monolithic conduit) will probably be needed to avoid excessive velocity in an excavated emergency spillway.

SITE NA-0215

Location: On a tributary to Wyman Pond approximately 2350 feet upstream from Worcester Road in Westminister, Massachusetts.

Gardner, Massachusetts Quadrangle

Latitude: $42^{\circ}31'05''$ Longitude: $71^{\circ}54'02''$

Engineering
Notes:

This site does not meet criteria for this study due to the small contributing drainage area; (248 acres), therefore, no further investigations were made.

SITE NA-0216

Location: On a tributary to Wyman Pond approximately 1000 feet upstream from Bolton Road in Wachusett Mountain State Reservation, Westminster, Massachusetts.

Gardner, Massachusetts Quadrangle

Latitude: 42°30'20" Longitude: 71°53'47"

Facilities Affected: No facilities affected below Elevation 1110

Geologic Conditions: Both abutments are silty sand and gravel glacial till and shallow to schist bedrock. Depth to bedrock in the foundation is not known, but probably 15 to 20 feet. There are no apparent leakage problems. Impervious borrow material for dam construction is available on site; however, rock greater than 6 inches may run 20 percent. Waterholding capabilities appear to be good.

Engineering Notes: The recommended location for an emergency spillway is at the left abutment.

Public Ownership: The entire site is within the Wachusett Mountain State Reservation.

SITE NA-0217

Location: On Flag Brook approximately 150 feet downstream from Cody Road in Leominster, Massachusetts.

Fitchburg, Massachusetts Quadrangle

Latitude: 42°32'07" Longitude: 71°51'03"

Facilities Affected:

<u>Below Elevation 810</u>	<u>Below Elevation 805</u>
1 Barn	1 Barn
3500 feet of Fitchburg Road	Cody Road
Cody Road	<u>Below Elevation 800</u>
	1 Barn
	Cody Road

Geologic Conditions: The right abutment is outwash sand, mostly fine to medium, with some gravel. The left abutment is englaciated drift and is shallow to granitic bedrock high on the abutment. Depth to granitic bedrock in foundation is not known, but may be 15 to 20 feet. There is a leakage problem in the right abutment and a possible leakage problem in the left abutment. Impervious borrow material for dam construction is available on site; however, rock greater than 6-inches may run 40 percent. Waterholding capabilities appear poor.

SITE NA-0217 Cont'd

Engineering
Notes:

The recommended location for an emergency spillway is at the right abutment. Waterholding capabilities can be improved if a positive cutoff can be made.

Public
Ownership:

About 75% of the land is owned by the Massachusetts Department of Natural Resources.

SITE NA-0218

Location:

At upstream end of Hobby's Pond in Gardner, Massachusetts.

Gardner, Massachusetts Quadrangle

Latitude: 42°36'33" Longitude: 71°58'21"

Facilities
Affected:

Below Elevation 1130
1000 feet of Raymond Road

Below Elevation 1120
850 feet of Raymond Road

Geologic
Conditions:

Both abutments are silty sand and gravel, glacial drift probably shallow to schist bedrock. Depth to schist bedrock in foundation is not known, but is probably shallow. There are no apparent leakage problems. Impervious borrow material for dam construction is available on site, but contains cobbles and boulders. Waterholding capabilities appear to be good.

Engineering
Notes:

The recommended location for an emergency spillway is at the right abutment.

SITE NA-0219

Location: On an unnamed tributary to South Ashburnham Reservoir in South Ashburnham approximately 1250 feet upstream from Route 101 in Ashburnham, Massachusetts.

Ashburnham, Massachusetts - New Hampshire Quadrangle

Latitude: $42^{\circ}37'34''$ Longitude: $71^{\circ}55'36''$

Facilities
Affected: No facilities affected below Elevation 1090.

Geologic
Conditions: The left abutment is thin englacial drift sand and gravel underlain by dense till. The right abutment is silty sand, dense glacial till. Depth to schist bedrock in foundation is not known, but may be 15 to 25 feet. There is a leakage problem in the left abutment. Impervious borrow material for dam construction is available on site; however, rock greater than 6 inches may run 25 percent. Waterholding capabilities appear to be poor.

Engineering
Notes: The recommended location for an emergency spillway is at the left abutment. Waterholding capabilities may be improved if a cutoff can be made on the left abutment.

SITE NA-0220

Location: On Phillips Brook approximately 250 feet upstream from Potato Hill Road in Westminster, Massachusetts.

Fitchburg, Massachusetts Quadrangle

Latitude: $42^{\circ}35'30''$ Longitude: $71^{\circ}51'42''$

Facilities
Affected: This site was eliminated from further study due to excessive facilities affected. (Route 12 and many houses)

Geologic
Conditions: The left abutment is englacial drift with a thin outwash sand and gravel at the surface. The right abutment is englacial drift, shallow to bedrock. Depth to bedrock in foundation is now known, but may be 15 to 20 feet. There is a leakage problem in the left abutment. Impervious borrow material for dam construction is available on site; however, rock greater than 6 inches may run 40 percent. Waterholding capabilities appear to be fair.

SITE NA-0220 (Cont'd)

Engineering
Notes:

The recommended location for an emergency spillway is at the right abutment. Waterholding capabilities may be improved if a positive cutoff to till or bed-rock can be made on the left abutment.

SITE NA-0221

Location:

On tributary to Whitman River approximately 2200 feet upstream from Ashburnham Road in Westminister, Massachusetts.

Gardner, Massachusetts Quadrangle.

Latitude: 42°35'10" Longitude: 71°53'30"

Facilities
Affected:

Below Elevation 970

4 Powerline Towers

Below Elevation 965

3 Powerline Towers

Below Elevation 950

3 Powerline Towers

Below Elevation 945

1 Powerline Tower

Below Elevation 930

1 Powerline Tower

Geologic
Conditions:

Both abutments are thin discontinuous englacial drift, silty sand with cobbles and boulders, shallow to bedrock (3 to 4 feet). There are schist outcrops in the foundation. There are no apparent leakage problems. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear to be fair.

Engineering
Notes:

The recommended location for an emergency spillway is at the right abutment. Waterholding capabilities can be improved if positive cutoff can be made.

SITE NA-0222

Location: On a tributary to Whitman River approximately 2000 feet upstream from East Gardner Road in Westminister, Massachusetts.

Gardner, Massachusetts Quadrangle

Latitude: $42^{\circ}34'33''$ Longitude: $71^{\circ}54'47''$

Facilities

Affected: Below Elevation 1015 Below Elevation 1005
250 feet of Overlook Road 50 feet of Overlook Road
Below Elevation 1010
100 feet of Overlook Road

Geologic

Conditions: Both abutments are silty sand or gravel with cobbles and boulders and clean gravel high on the left abutment. Depth to schist bedrock in the foundation is not known, but may be 15 to 25 feet. There are no apparent leakage problems except high on the left abutment. Impervious borrow material for dam construction is available on-site, but contains cobbles and boulders. Waterholding capabilities appear good.

Engineering

Notes: The recommended location for an emergency spillway is at the left abutment.

SITE NA-0223

Location: On a tributary to Round Meadow Pond approximately 550 feet upstream from Town Farm Road in Westminister, Massachusetts.

Gardner, Massachusetts Quadrangle

Latitude: $42^{\circ}32'55''$ Longitude: $71^{\circ}54'03''$

Geologic

Conditions: Both abutments are silty sand or gravel, probably shallow to bedrock. Depth to schist bedrock in foundation is not known, but may be 15 to 25 feet. There are no apparent leakage problems. Impervious borrow material for dam construction is available on site; however, rock greater than 6 inches may run 20 percent. Waterholding capabilities appear good.

Remarks:

This site does not meet criteria for this study due to the size of the contributing drainage area, (less than 0.5 square miles), therefore, no design summary was made.

SITE NA-0223 (Cont'd)

Engineering
Notes:

The recommended location for an emergency spillway is at the right abutment. A sufficient quantity of borrow material is not available on site.

SITE NA-0224

Location:

At outlet end of marsh area approximately 700 feet upstream of Gardner Road in Westminister, Massachusetts.
Gardner, Massachusetts Quadrangle

Latitude: $42^{\circ}34'12''$ Longitude: $71^{\circ}54'29''$

Facilities
Affected:

No facilities affected below elevation 995.

Geologic
Conditions:

Both abutments are silty sand or gravel with cobbles and boulders. Depth to schist bedrock not known, but may be 20 to 25 feet. There are no apparent leakage problems. Impervious borrow for dam construction is available on site; however, rock greater than 6 inches may run 15 percent. Waterholding capabilities appear good.

Engineering
Notes:

The recommended location for an emergency spillway is at the right abutment.

SITE NA-0225

Location:

On a tributary to reservoir in South Ashburnham approximately 500 feet upstream from Barrel Road in Ashburnham, Massachusetts.

Gardner, Massachusetts Quadrangle

Latitude: $42^{\circ}36'25''$ Longitude: $71^{\circ}54'10''$

Facilities
Affected:

No facilities affected below elevation 1055.

SITE NA-0225 (Cont'd)

Geologic

Conditions:

The right abutment is silty sand. Glacial till may be shallow to bedrock. The left abutment is thin englacial drift with outcrops of bedrock. Depth to schist bedrock is not known, but may be 5 to 10 feet. There are no apparent leakage problems. Impervious borrow material for dam construction is available on site; however, rock greater than 6 inches may run 15 percent. Water-holding capabilities appear good.

Engineering

Notes:

The recommended location for an emergency spillway is at the left abutment.

NA-0226 -- LAKE WAMPANOAG

Location: On the Whitman River in South Ashburnham,
Massachusetts.

Gardner, Massachusetts Quadrangle

Latitude: $42^{\circ}36'59''$ Longitude: $71^{\circ}57'25''$

Surface Area (Acres)	Height of Dam (Ft.)	Drainage Area (Acres)	(Sq. Mi.)
268	25	1860	2.90

Potential
for
Expansion:

Expansion potential is limited by size of the pool area in relation to drainage area. Evaporation losses would increase as the pool area increased.

Remarks:

This is an earth fill dam with a concrete weir spillway about 40 feet wide and 6 feet deep. The upstream face is rock riprapped.
The dam and spillway are in good condition except for a few small trees at the downstream toe.

NA-0227 -- SOUTH ASHBURNHAM RESERVOIR

Location: On the Whitman River, 4500 feet upstream
of Whitmanville, Westminister, Massachusetts.
Gardner, Massachusetts Quadrangle
Latitude: 42°35'32" Longitude: 71°54'38"

<u>Surface Area</u> <u>(Acres)</u>	<u>Height of</u> <u>Dam (Ft.)</u>	<u>Drainage</u> <u>(Acres)</u>	<u>Area</u> <u>(Sq. Mi.)</u>
116	25	8000	12.49

Potential
for

Expansion: Some expansion is possible, but South
Ashburnham Road would be affected by any
major enlargement of the reservoir.

Remarks: This is an earth dam with a modified concrete
chute spillway at the right abutment. Spillway
weir is about 40 feet wide with about 6 feet
of freeboard. There are trees on the downstream
slope of the dam, but the earthfill and spillway
appear to be in good condition.

Geologic
Conditions: The right abutment is outwash sand and gravel,
but may be shallow to schist bedrock. The
left abutment is thin englacial drift, silty
sand and gravel. There are schist bedrock
outcrops in the foundation. There is a
possible leakage problem in the right abutment.
Impervious borrow material for dam construction
possibly is available on the left abutment.
Waterholding capabilities appear good.



SITE NA-0228

Location: On a tributary to Phillips Brook approximately
2000 feet upstream from Ashburnham Street in
Fitchburg, Massachusetts.
Fitchburg, Massachusetts Quadrangle
Latitude: $42^{\circ}35'17''$ Longitude: $71^{\circ}50'34''$

Facilities
Affected: No facilities affected below elevation 860.

Geologic
Conditions: Both abutments are schist bedrock with thin dis-
continuous glacial drift at the surface. Depth
to bedrock in foundation is not known, but may be 5
to 10 feet. There are no apparent leakage problems.
Impervious borrow material for dam construction
was not located on site. Waterholding capabilities
appear good.

Engineering
Notes: The recommended location for an emergency spillway
is at the right abutment.

SITE NA-0229

Location: On a tributary to Whitman River between two
branches of the Boston and Maine Railroad and
approximately 3500 feet northeast of watertowers
at the State Hospital in Gardner, Massachusetts.
Gardner, Massachusetts Quadrangle
Latitude: $42^{\circ}35'19''$ Longitude: $71^{\circ}56'09''$

Facilities
Affected: No facilities affected below elevation 1060.

Geologic
Conditions: Both abutments are silty sand, glacial till.
Depth to schist bedrock not known, but may be
25 to 30 feet. There are no apparent leakage
problems. Impervious borrow material for dam
construction is available on site, but contains
cobbles and boulders. Waterholding capabilities
appear good.

Engineering
Notes: The recommended location for an emergency spillway
is at the left abutment.

NA-0230 -- MEETINGHOUSE POND

Location: Near Academy Hill in Westminster, Massachusetts
Gardner, Massachusetts Quadrangle.

Latitude: $42^{\circ}32'03''$ Longitude: $71^{\circ}54'20''$

<u>Surface Area</u> <u>(Acres)</u>	<u>Height of</u> <u>Dam (Ft.)</u>	<u>Drainage</u> <u>(Acres)</u>	<u>Area</u> <u>(Sq. Mi.)</u>
158	15	1080	1.69

Potential
for
Expansion:

It appears that the reservoir could be expanded, but watershed yield might be a limiting factor.

Remarks:

This reservoir is part of the Fitchburg Water Supply. The embankment of Princeton Road ties into the earth fill dam. Downstream face of Princeton Road fill is vertical with rock retaining wall. Upstream slope has been riprapped.

Dam abutments are rock ledge. Spillway is a concrete weir (30' wide) with flashboards. Total structure appears to be in good condition.



NA-0231 -- CROCKER POND

Location: Near South Ashburnham Road, 7500 feet south of Whitmanville, Westminister, Massachusetts. Do not confuse with NA-0241 also called Crocker Pond.

Gardner, Massachusetts Quadrangle

Latitude: $42^{\circ}34'08''$ Longitude: $71^{\circ}52'53''$

<u>Surface Area</u> <u>(Acres)</u>	<u>Height of</u> <u>Dam (Ft.)</u>	<u>Drainage</u> <u>(Acres)</u>	<u>Area</u> <u>(Sq. Mi.)</u>
101	30	13560	21.19

Potential
for
Expansion:

South Ashburnham Road and railroad limit expansion. See Geologic Conditions.

Remarks:

Earthfill dam in good condition. Spillway is an ogee weir with about 100 foot length.

Geologic
Conditions:

Both abutments are outwash sand or gravel. There are bedrock outcrops in the foundation. There are leakage problems in both abutments. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear poor above present water level.



NA-0232 -- WACHUSETT LAKE

Location: Near intersection of Worcester and
Whitehouse Roads in Westminister,
Massachusetts.

Gardner, Massachusetts Quadrangle

<u>Surface Area</u> <u>(Acres)</u>	<u>Height of</u> <u>Dam (Ft.)</u>	<u>Drainage</u> <u>(Acres)</u>	<u>Area</u> <u>(Sq. Mi.)</u>
147	5	1030	1.61

Potential
for
Expansion:

This reservoir could be expanded, but the
small drainage area would probably limit
yield.

Remarks:

Worcester Road forms the dam for this
reservoir. The spillway is a stone culvert
under the road. This lake is a part of the
Fitchburg Water Supply.

Geologic
Conditions:

Both abutments are sand and gravel, glacial
outwash. Depth to schist bedrock in founda-
tion not known, but may be 40 to 50 feet.
There are leakage problems in both abutments.
Imprevious borrow material for dam construc-
tion was not located on site. Waterholding
capabilities appear to be poor above present
water level.



NA-0233 -- WINNEKEAG LAKE

Location: West of Route 101 about 7000 feet north
of Ashburnham Center.

Ashburnham, Massachusetts Quadrangle

<u>Surface Area</u> <u>(Acres)</u>	<u>Height of Dam</u> <u>(Ft.)</u>	<u>Drainage Area</u>	
		<u>(Acres)</u>	<u>(Sq. Mi.)</u>
115	20	1440	2.25

Potential
for
Expansion: Limited by cottages around the lake and
Route 101.

Remarks: This is an earthfill dam about 30 feet
wide at top. Downstream slope is about
 $\frac{1}{4}$ to 1 with placed stone face. Upstream
slope is 3:1 with riprap. Spillway at the
right abutment is a 30 foot wide concrete
weir with provision for flashboards.
Dam appears to be in good condition, but
apparent seepage was noted at the vertical
downstream face.

NA-0234 -- FACTORY VILLAGE POND

Location: South of Main Street (Route 12) near
Blackburn Village on the Ashburnham-
Westminster town line.

Ashburnham, Massachusetts Quadrangle

<u>Surface Area</u> <u>(Acres)</u>	<u>Height of Dam</u> <u>(Ft.)</u>	<u>Drainage Area</u>	
		<u>(Acres)</u>	<u>(Sq. Mi.)</u>
10	20	3190	4.99

Potential
for
Expansion:

Expansion would affect Route 12. Potential
site NA-0203 about 1500 feet upstream seems
more feasible.

Remarks:

This is an earth fill dam with stone downstream
face. Spillway section has a 75 foot wide
stone weir and a 10 foot wide concrete ogee
section. There are large trees growing in the
left side of the dam and quite a bit of seepage
under the dam in the vicinity of two pipe
spillways.

NA-0235 -- ROUND MEADOW POND

Location: At the intersection of old Route 2 and 2A
in Westminster, Massachusetts.

Gardner, Massachusetts Quadrangle

<u>Surface Area</u> <u>(Acres)</u>	<u>Height at</u> <u>Dam (Ft.)</u>	<u>Drainage</u> <u>(Acres)</u>	<u>Area</u> <u>(Sq. Mi.)</u>
58	7	2910	4.54

Potential
for
Expansion:

Expansion is limited by roads on all sides.

Remarks:

This is a low earthfill dam with a 50 foot wide concrete weir spillway. Upstream face of dam is rock riprapped. There is some concrete spalling near the waterline at the weir sidewalls. Dam appears to be in good condition.



NA-0236 - PARTRIDGE POND (Ellis Pond)

Location: Upstream of Ellis Road in Westminster,
Massachusetts.

Gardner, Massachusetts Quadrangle

Surface Area (Acres)	Height of Dam (Ft.)	Drainage Area	
		(Acres)	(Sq. Mi.)
28	6	360	0.56

Potential
for
Expansion:

This site does not have potential for significant expansion. Cottages are located all around the pond. Drainage area is small for this size pond.

Remarks:

Ellis Road is the dam for this pond. Spillway is a 24-inch diameter pipe. There is only about 2 feet of freeboard between the normal water surface and Ellis Road; it appears that water does flow over the road during storms.

There are trees growing on the road side slopes. General condition of the dam is poor.

NA-0237 -- WYMAN POND

Location: Upstream of East Road in Westminster,
Massachusetts.

Gardner, Massachusetts Quadrangle.

<u>Surface Area</u> <u>(Acres)</u>	<u>Height of</u> <u>Dam (Ft.)</u>	<u>Drainage</u> <u>(Acres)</u>	<u>Area</u> <u>(Sq. Mi.)</u>
205	20	5010	7.83

Potential
for
Expansion:

Limited by existing lakeside cottages.

Remarks:

This pond is a part of the Fitchburg Water Supply. Structure is an earth dam built in the late 1800's. Upstream slope of the dam is riprapped. Spillway has a 50 foot weir leading to a masonry chute spillway. Dam and spillway are in good condition.



NA-0238 -- SNOWS MILL POND

Location: Waites Corner in Fitchburg, Massachusetts.

Fitchburg, Massachusetts Quadrangle.

<u>Surface Area</u> <u>(Acres)</u>	<u>Height of</u> <u>Dam (Ft.)</u>	<u>Drainage</u> <u>(Acres)</u>	<u>Area</u> <u>(Sq. Mi.)</u>
26	15	18450	28.83

Potential
for
Expansion:

Limited by Westminster Road and the
Boston and Maine Railroad.

Remarks:

This is a mill pond with various intake
structures to use the water. The main
spillway has an overflow weir about 100 feet
long. Structure appears in good condition.



NA-0239 -- SAWMILL POND

Location: South of Route 2 in Fitchburg, Massachusetts.
Fitchburg, Massachusetts Quadrangle

<u>Surface Area</u> <u>(Acres)</u>	<u>Height of Dam</u> <u>(Ft.)</u>	<u>Drainage Area</u>	
		<u>(Acres)</u>	<u>(Sq. Mi.)</u>
63	12	7600	11.86

Potential
for
Expansion: Limited by Routes 2 and 31.

Remarks: This is a weir overflow dam with vertical
stone face capped with concrete. Structure
is in fairly good condition.

NA-0240 -- CROW HILL POND

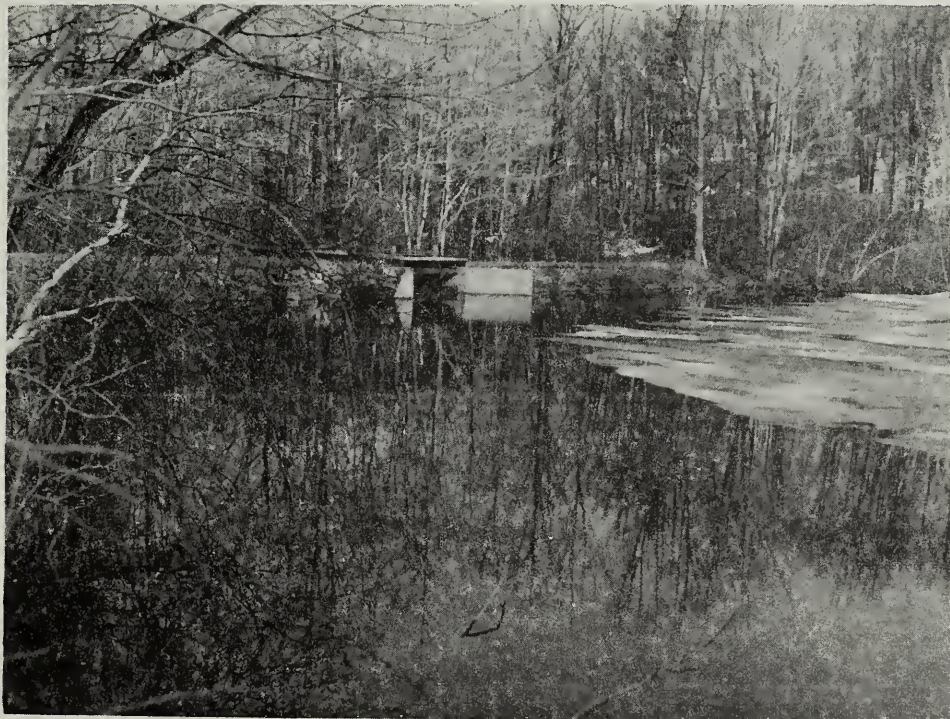
Location: East of Route 31 near intersection of
Notown Road in Leominster, Massachusetts.

Fitchburg, Massachusetts Qudrangle.

<u>Surface Area</u> <u>(Acres)</u>	<u>Height of</u> <u>Dam (Ft.)</u>	<u>Drainage</u> <u>(Acres)</u>	<u>Area</u> <u>(Sq. Mi.)</u>
7	10	430	0.67

Potential for
Expansion: Leakage through sand and gravel may limit
expansion. Drainage area is small.

Remarks: This is an earthfill dam. Upstream face is
riprapped. Spillway is a concrete drop
structure with a 10 foot weir and 3 foot
drop. Condition is good except for small
trees and brush growing on slopes.



NA-0241 -- CROCKER POND

Location: East of Route 31, about 3300 feet south of intersection of Route 31 and Notown Road in Westminister, Massachusetts. Do not confuse with NA-0231, also named Crocker Pond.

Fitchburg, Massachusetts Quadrangle

<u>Surface Area</u> (Acres)	<u>Height of Dam</u> (Ft.)	<u>Drainage Area</u>	
		(Acres)	(Sq. Mi.)
10	15	180	0.28

Potential
for

Expansion: Route 31 limits expansion. Site drainage area is rather small and limits expansion.

Remarks:

Fitchburg Road forms the dam for the lower portion of the pond. Spillway is a concrete drop structure about 5 feet wide with a two foot opening. Weir crest is about 5 feet from top of road. Structure is in good condition. A low earth-fill dam crosses this pond about 800 feet upstream of the spillway. The fill is about 8 feet high with a bituminous paved spillway over the fill. The spillway is in poor condition due to undermining and frost heaves. This structure also has a pipe drain through the fill.

NA-0242 -- MAC TAGGART'S POND

Location: On Phillips Brook 500 feet upstream of
Westminster Hill Road in Fitchburg,
Massachusetts.

Fitchburg, Massachusetts Quadrangle

<u>Surface Area</u> <u>(Acres)</u>	<u>Height of Dam</u> <u>(Ft.)</u>	<u>Drainage Area</u> <u>(Acres)</u>	<u>(Sq. Mi.)</u>
10	20	9810	15.33

Potential
for
Expansion:

Surface area could be nearly tripled without
effecting any facilities.

Remarks:

This is a former mill dam. The dam is a
large concrete weir structure about 20 feet
high. Structure is in fair condition with
some concrete spalling and seepage near the
right abutment at the base of the concrete
wall.

NA 0243 -- LINCOLN POND

Location: About 1200 feet upstream of Stowell Road in
Ashburnham, Massachusetts

Ashburnham, Massachusetts Quadrangle.

<u>Surface Area</u> <u>(Acres)</u>	<u>Drainage Area</u>	
	<u>(Acres)</u>	<u>(Sq.Mi.)</u>
29	470	0.73

Remarks: Lincoln Pond has no dam.

NOTES

SUMMARY DATA FOR POTENTIAL UPSTREAM RESERVOIR SITES

STUDY AREA-NASHUA RIVER										SUBWATERSHED-NASHUA RIVER									
BENEFICIAL POOL										*****									
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SUMMARY DATA FOR POTENTIAL UPSTREAM RESERVOIR SITES

STUDY AREA-NASHUA RIVER														
SUBWATERSHED-NASHUA RIVER														
BENEFICIAL POOL														
* EMERGENCY SPILLWAY * DESIGN * DAM * SAFE * YIELD * * * * *														
* COST * STORAGE * AT CREST * PER * ELEV AREA * TOP * HGT VOL *CHANCE * * * * *														
ELEV	STORAGE	PER AC FT	COST	AREA	SURF AC	DEPTH AT DAM	CREST ELEV	STORAGE	PER AC FT	ELEV	AREA	TOP	HGT	VOL
(MSL)	AC FT	IN	(\$)	(AC)	(\$)	(FT)	(MSL)	AC FT	IN	(\$)	(MSL)	(AC)	FT	CY
DA= 1.00 SQ MI = 640 AC USGS QUAD- ASHBY MASS-NH LATITUDE 42-37-30 LONGITUDE 71-52-08 SITE RATING (1) STREAM WATER QUALITY (B) 100-YR PRIN SPHY DESIGN STORM RUNOFF = 8.20 IN. PEAK FLOW = 177 CFS														
942.4	0	0.0	2	14	30370	8.3	963.4	E	221	4.1	2060	25	968.5	35
957.3	100	1.9	4320	14	30370	23.2	959.8	E	146	2.7	2950	21	963.6	30
968.6	347	6.5	1620	29	19060	34.7	971.1	E	434	8.1	1290	36	975.3	41
978.8	717	13.3	1020	43	16820	44.8	981.3	E	843	15.7	870	53	986.0	52
988.1	1210	22.7	790	63	15140	54.1	990.6	E	1385	26.0	690	77	995.9	62
990.0	1333	25.0	750	67	14770	56.0	992.5	E	1525	28.5	650	82	997.5	64
DA= 1.00 SQ MI = 640 AC USGS QUAD- GARDNER MASS LATITUDE 42-34-18 LONGITUDE 71-55-20 SITE RATING (1) STREAM WATER QUALITY (B) 100-YR PRIN SPHY DESIGN STORM RUNOFF = 8.20 IN. PEAK FLOW = 177 CFS														
1012.6	0	0.0	6	26	13940	1.7	1022.5	E	221	4.1	1490	48	1027.5	17
1019.0	100	1.9	3640	26	13940	8.0	1021.5	E	187	3.5	1950	44	1025.4	14
1025.5	347	6.5	1340	50	9170	14.5	1028.0	E	491	9.2	940	69	1032.4	21
1031.4	717	13.3	840	72	8380	20.4	1033.9	E	910	17.1	660	84	1039.4	28
1037.6	1210	22.7	660	88	9120	26.7	1040.1	E	1444	27.0	550	96	1045.9	35
1039.0	1333	25.0	630	91	9140	28.0	1041.5	E	1576	29.5	530	98	1047.1	36
DA= 1.10 SQ MI = 704 AC USGS QUAD- GARDNER MASS LATITUDE 42-32-50 LONGITUDE 71-55-58 SITE RATING (3) STREAM WATER QUALITY (B) 100-YR PRIN SPHY DESIGN STORM RUNOFF = 8.20 IN. PEAK FLOW = 194 CFS														
1092.0	0	0.0	20	32	10280	4.0	1098.1	E	315	5.4	1090	78	1103.3	15
1093.6	100	1.7	3250	32	10280	5.6	1096.1	E	209	3.5	1550	65	1100.3	12
1099.1	373	6.4	1270	69	6910	11.2	1101.6	E	574	9.8	830	103	1107.0	19
1104.0	783	13.3	790	102	6060	16.0	1106.5	E	1071	18.2	580	1108.0	131	23
1108.6	1330	22.7	550	135	5380	20.6	1111.1	E	1700	29.0	430	1111.9	159	27
1109.6	1467	25.0	510	142	5220	21.6	1112.1	E	1854	31.5	400	1112.6	166	28
NOTES - (1) COSTS ARE BASED ON 1971 S.C.S. DESIGN CRITERIA AND COST DATA. (2) EMERGENCY SPILLWAY STORAGE AND COSTS ARE BASED ON TOTAL STORAGE, INCLUDING BENEFICIAL POOL. (3) EMERGENCY SPILLWAY TYPE CODE- C=CONCRETE CHUTE, D=CONCRETE DROP, E=EXCAVATED, T= TWO SPILLWAYS, N= NONE (4) TABULAR DATA ARE BASED ON PRELIMINARY INFORMATION. FIGURES SHOWN ARE PRIMARILY FOR COMPARISON PURPOSES. (5) ELEVATIONS ARE SHOWN TO THE NEAREST 0.1 FOOT TO SHOW VARIATION BETWEEN DEVELOPMENTS ONLY, AND ARE NOT TO BE CONSIDERED ACCURATE TO THAT DEGREE.														

DO NOT USE FOR FINAL SITE SELECTION OR LAND ACQUISITION.

SUMMARY DATA FOR POTENTIAL UPSTREAM RESERVOIR SITES

STUDY AREA-NASHUA RIVER									
SUBWATERSHED-NASHUA RIVER									
BENEFICIAL POOL									

SUMMARY DATA FOR POTENTIAL UPSTREAM RESERVOIR SITES

STUDY AREA-NASHUA RIVER SUBWATERSHED-NASHUA RIVER

BENEFICIAL POOL

EMERGENCY SPILLWAY

DESIGN

DAM

SAFE

YIELD

AT 95

PERCENT

CHANCE

VOL

CY

(MGD)

LATITUDE 42-36-33

LONGITUDE 71-58-21

RUNOFF = 8.20 IN. PEAK FLOW = 141 CFS

USGS QUAD- GARDNER MASS

100-YR PRIN SPWY DESIGN STORM

RUNOFF = 8.20 IN. PEAK FLOW = 141 CFS

USGS QUAD- GARDNER MASS

100-YR PRIN SPWY DESIGN STORM

RUNOFF = 8.20 IN. PEAK FLOW = 141 CFS

USGS QUAD- GARDNER MASS

100-YR PRIN SPWY DESIGN STORM

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100-YR PRIN SPWY DESIGN STORM

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USGS QUAD- GARDNER MASS

100-YR PRIN SPWY DESIGN STORM

RUNOFF = 8.20 IN. PEAK FLOW = 141 CFS

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RUNOFF = 8.20 IN. PEAK FLOW = 141 CFS

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USGS QUAD- GARDNER MASS

100-YR PRIN SPWY DESIGN STORM

RUNOFF = 8.20 IN. PEAK FLOW = 141 CFS

USGS QUAD- GARDNER MASS

100-YR PRIN SPWY DESIGN STORM

RUNOFF = 8.20 IN. PEAK FLOW = 141 CFS

USGS QUAD- GARDNER MASS

100-YR PRIN SPWY DESIGN STORM

RUNOFF = 8.20 IN. PEAK FLOW = 141 CFS

NOTES - (1) COSTS ARE BASED ON 1971 S.C.S. DESIGN CRITERIA AND COST DATA.
 (2) EMERGENCY SPILLWAY STORAGE AND COSTS ARE BASED ON TOTAL STORAGE, INCLUDING BENEFICIAL POOL.
 (3) EMERGENCY SPILLWAY TYPE CODE- C=CONCRETE CHUTE, D=CONCRETE DROP, E=EXCAVATED, T= TWO SPILLWAYS, N= NONE
 (4) TABULAR DATA ARE BASED ON PRELIMINARY INFORMATION. FIGURES SHOWN ARE PRIMARILY FOR COMPARISON PURPOSES.
 (5) ELEVATIONS ARE SHOWN TO THE NEAREST 0.1 FOOT TO SHOW VARIATION BETWEEN DEVELOPMENTS ONLY, AND ARE NOT TO BE CONSIDERED ACCURATE TO THAT DEGREE.

** DO NOT USE FOR FINAL SITE SELECTION OR LAND ACQUISITION. **

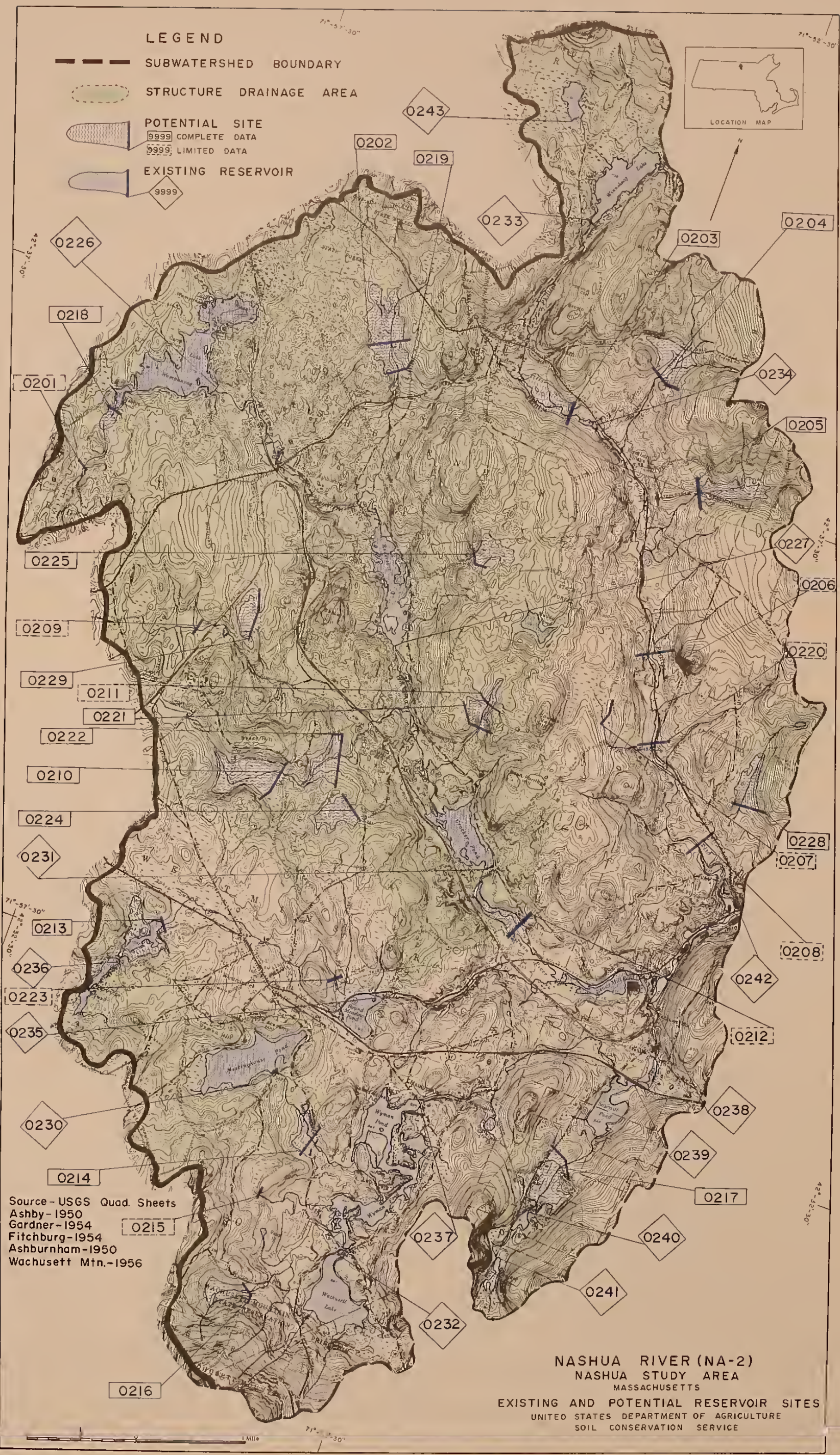
SUMMARY DATA FOR POTENTIAL UPSTREAM RESERVOIR SITES

STUDY AREA-NASHUA RIVER										SUBWATERSHED-NASHUA RIVER									
BENEFICIAL POOL										EMERGENCY SPILLWAY									
* * * * *										* * * * *									
ELEV	STORAGE	PER AC FT	AREA (AC)	COST (\$)	SURF AC	DEPTH AT DAM	CREST ELEV	STORAGE AT CREST	COST PER AC FT	DESIGN HIGH WATER	DAM	SAFE YIELD	* * * * *						
(MSL)	AC FT	IN	(AC)	(\$)			++ TYPE	AC FT	IN	(MSL)	(AC)	(MSL)	FT	CY	FILL VOL	PERCENT CHANCE	AT 95		
DA= 0.60 SQ MI = 384 AC USGS QUAD- FITCHBURG MASS LATITUDE 42-35-17 LONGITUDE 71-50-34																			
STREAM WATER QUALITY (B) 100-YR PRIN SPWY DESIGN STORM RUNOFF = 8.20 IN. PEAK FLOW = 106 CFS																			
SITE RATING (1) * * * * *																			
808.3	0	0.0	2	830.4	E	133	4.1	6740	832.8	11	835.5	30	65	65	94	0.24			
834.4	170	5.3	12	92790	E	205	6.4	5230	839.3	14	840.6	36	94	94	0.24				
843.3	310	9.7	22	57930	E	375	11.7	3410	848.1	33	850.3	45	164	164	0.33				
850.5	520	16.2	38	39780	E	625	19.5	2400	855.3	47	857.9	53	241	241	0.42				
856.8	800	25.0	50	33500	E	936	29.2	1810	861.3	59	864.5	59	331	331	0.50				
* * * * *																			
DA= 0.60 SQ MI = 384 AC USGS QUAD- GARDNER MASS LATITUDE 42-35-19 LONGITUDE 71-56-09																			
STREAM WATER QUALITY (B) 100-YR PRIN SPWY DESIGN STORM RUNOFF = 8.20 IN. PEAK FLOW = 106 CFS																			
SITE RATING (1) * * * * *																			
1027.0	0	0.0	3	1043.1	E	133	4.1	3000	1045.5	17	1047.6	24	36	36	78	0.28	60		
1040.8	100	3.0	11	41060	E	136	4.1	3360	1045.6	17	1046.8	23	33	33	78	0.28			
1048.9	228	7.1	21	36760	E	291	9.1	2630	1053.6	28	1055.1	31	78	78	0.28				
1056.3	421	13.1	31	35240	E	508	15.8	2170	1061.0	38	1062.9	39	147	147	0.37				
1061.8	613	19.2	39	35070	E	717	22.4	1880	1066.6	43	1068.9	45	223	223	0.46				
1062.5	640	20.0	39	35270	E	746	23.2	1860	1067.1	44	1069.5	46	233	233	0.47				
* * * * *																			
NOTES - (1) COSTS ARE BASED ON 1971 S.C.S. DESIGN CRITERIA AND COST DATA.																			
(2) EMERGENCY SPILLWAY STORAGE AND COSTS ARE BASED ON TOTAL STORAGE, INCLUDING BENEFICIAL POOL.																			
(3) EMERGENCY SPILLWAY TYPE CODE- C=CONCRETE CHUTE, D=CONCRETE DROP, E=EXCAVATED, T= TWO SPILLWAYS, N= NONE																			
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(5) ELEVATIONS ARE SHOWN TO THE NEAREST 0.1 FOOT TO SHOW VARIATION BETWEEN DEVELOPMENTS ONLY, AND ARE NOT TO BE CONSIDERED ACCURATE TO THAT DEGREE.																			
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DO NOT USE FOR FINAL SITE SELECTION OR LAND ACQUISITION.

LEGEND

- SUBWATERSHED BOUNDARY
- STRUCTURE DRAINAGE AREA
- POTENTIAL SITE
 - 9999 COMPLETE DATA
 - 9999 LIMITED DATA
- EXISTING RESERVOIR
 - 9999



Source - USGS Quad. Sheets
 Ashby - 1950
 Gardner - 1954
 Fitchburg - 1954
 Ashburnham - 1950
 Wachusett Mtn. - 1956

NASHUA RIVER (NA-2)
 NASHUA STUDY AREA
 MASSACHUSETTS
 EXISTING AND POTENTIAL RESERVOIR SITES
 UNITED STATES DEPARTMENT OF AGRICULTURE
 SOIL CONSERVATION SERVICE

NASHUA STUDY AREA
SITE DATA FOR

Subwatershed NA-3, North Nashua River

The subwatershed covers about 26,600 acres in Ashby-Middlesex County, and Fitchburg, Leominster, Lunenburg and Westminster in Worcester County. The North Nashua River flows southeasterly through the watershed from Fitchburg to Leominster.

The main streams are Monoosnoc Brook which originates in the hills above Notown Reservoir and flows easterly through Leominster to the North Nashua River; and Falulah Brook which originates in the north western corner of Fitchburg and flows southeasterly to Leominster where it joins the North Nashua River. Elevations range from a high of about 1410 on Jewell Hill to about 290 in Leominster. Geology within the subwatershed is characterized by schist bedrock at depths of 10 to 50 feet, overlain by glacial till or englacial drift.

Sixteen potential reservoir sites and 11 existing reservoirs were studied. Design summaries are included for six potential sites that meet study criteria.

SITE NA-0301

Location: On a tributary to Falulah Brook approximately 2400 feet upstream from Ashby West Road in Fitchburg, Massachusetts.

Ashby, Massachusetts-New Hampshire Quadrangle.

Latitude: 42°38'04" Longitude: 71°50'44"

Facilities

Affected: No facilities affected below elevation 1025.

Geologic

Conditions: Both abutments are silty sand and gravel, thin and discontinuous, with schist bedrock outcrops. Depth to schist bedrock in foundation, not know, but may be 15 to 25 feet. There are no apparent leakage problems. Impervious borrow material for dam construction is available on site; however, rock greater than 6-inches may run 30 percent. Waterholding capabilities appear good.

Engineering

Notes: The recommended location for an emergency spillway is at the right abutment.

SITE NA-0302

Location: On a tributary to Falulah Brook approximately
2900 feet upstream from Ashby West Road in
Fitchburg, Massachusetts.

Ashby, Massachusetts Quadrangle

Latitude: $42^{\circ}37'43''$ Longitude: $71^{\circ}50'50''$

Remarks: This site did not meet criteria for this study
due to the small contributing drainage area
(147 acres), therefore, no further investigations
were made.

SITE NA-0303

Location: On Falulah Brook in Fitchburg, Massachusetts.
800 feet downstream of Ashby West Road.

Ashby, Massachusetts Quadrangle

Latitude: $42^{\circ}37'53''$ Longitude: $71^{\circ}50'05''$

Remarks: This is the Shattuck Dam proposed in the Army
Corps of Engineers North Nashua Study.
For further information on this site see:
"Water Resource Development Plan - North Nashua
River Basin," U.S. Army Engineer Division, New
England Corps of Engineers, Waltham, Massachusetts,
January 1965.

Site topography, costs, etc., are presented in
the Appendices to the Corps' report.

SITE NA-0304

Location: On a tributary to Green's Pond approximately
4100 feet upstream from Billings Road in
Fitchburg, Massachusetts.

Ashby, Massachusetts-New Hampshire Quadrangle

Latitude: 42°37'54" Longitude: 71°48'13"

Facilities
Affected: No facilities affected below elevation 825.

Geologic
Conditions: Both abutments are silty sand and gravel, glacial
till, and probably shallow to schist bedrock. There
may be a small sand and gravel terrace at the toe
of the left abutment. Depth to schist bedrock in
the foundation is not known, but may be 15 to 25 feet.
There are no apparent leakage problems except
possibly in the gravel terrace at the toe of the
left abutment. Impervious borrow material for dam
construction is available on site; however, rock
greater than 6-inches may run to 20 percent. Water-
holding capabilities appear to be good.

Engineering
Notes: The recommended location for an emergency spillway
is at the right abutment.

SITE NA-0305

Location: On tributary to Saima Pond and Falulah Brook
in Fitchburg, Massachusetts. 1000 feet southwest
of the intersection of Route 31 and Kinsman Road.

Fitchburg, Massachusetts Quadrangle

Latitude: 42°37'09" Longitude: 71°48'22"

Remarks: This is the Saima Dam proposed in the Army
Corps of Engineers North Nashua Study.
For further information on this site see
"Water Resource Development Plan -- North Nashua
River Basin," U.S. Army Engineer Division, New
England Corps of Engineers, Waltham, Massachusetts,
January 1965.

Site topography, costs, etc., are presented in
the Appendices to the Corps' report.

SITE NA-0306

Location: On a tributary to Falulah Brook approximately 200 feet upstream from Fisher Road in Fitchburg, Massachusetts.

Fitchburg, Massachusetts Quadrangle

Latitude: 42°36'35" Longitude: 71°47'02"

Engineering
Notes:

This site did not meet criteria for this study due to the small contributing drainage area, therefore, no further investigations were made.

SITE NA-0307

Location: On Pearl Hill Brook approximately 600 feet upstream from Northfield Road in Lunenburg, Massachusetts.

Fitchburg, Massachusetts Quadrangle

Latitude: 42°36'30" Longitude: 71°46'11"

Facilities
Affected:

Below design high water elevation 505
11 houses

1050 feet of gas pipeline
Townsend Road

Below design high water elevation 495
11 houses

750 feet of gas pipeline
Townsend Road

Below design high water elevation 490
8 houses

650 feet of gas pipeline
Townsend Road

Below design high water elevation 480
3 houses

450 feet of gas pipeline
Townsend Road

Geologic
Conditions:

The left abutment is outwash sand and gravel at the toe of the slope with thin englacial drift higher on the slope and underlain by schist bedrock. The right abutment is outwash sand and gravel at the lower terrace and englacial drift higher on the slope. Depth to schist bedrock is not known, but may be 10 to 15 feet.

SITE NA-0307 (Cont'd)

Geologic
Conditions:
(Cont'd)

There are leakage problems in both abutments. Impervious borrow material for dam construction is available on site. Waterholding capabilities appear poor.

Engineering
Notes:

The recommended location for an emergency spillway is at the left abutment. Waterholding capabilities may be improved if a positive cutoff to till or bedrock can be made. There are lots of large boulders in the foundation area.

SITE NA-0308 -- OLD PAGES POND

Location: On Pearl Hill Brook, 400 feet upstream
of Pearl Street in Lunenburg, Massachusetts.

Fitchburg, Massachusetts Quadrangle

Latitude: 42°35'44" Longitude: 71°46'04"

Remarks: This is the Pearl Hill Dam proposed in the
North Nashua River Basin report. For
further information on this site see "Water
Resource Development Plan -- North Nashua
River Basin," U.S. Army Engineer Division,
New England Corps of Engineers, Waltham,
Massachusetts, January 1965.

Site information, costs, etc., are contained
in the Appendices to the Corps of Engineers
report.

There is also an existing pond at this site
with a stone mill dam built in 1830. The
dam is about 10 feet high. There are two
spillways -- an 8 foot weir and 3 foot weir.
The dam is in fair condition with some minor
seepage and trees growing along the downstream
slope.

SITE NA-0309

Location: On a tributary to Pearl Hill Brook approximately 2800 feet upstream from Pleasant Street in Lunenburg, Massachusetts.

Fitchburg, Massachusetts Quadrangle.

Latitude: 42°35'08" Longitude: 71°45'40"

Facilities

Affected: Below elevation 475
1100 feet of West Street

Below elevation 470
200 feet of West Street

Geologic

Conditions: Both abutments are outwash sand and gravel. Depth to schist bedrock in foundation not known, but may be 20 to 25 feet. There are leakage problems in both abutments and the foundation. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear to be poor.

Engineering

Notes: The recommended location for an emergency spillway is at the left abutment.

SITE NA-0310

Location: On a tributary to Notown Reservoir approximately 1000 feet upstream from Fifth Street in Fitchburg, Massachusetts.

Fitchburg, Massachusetts Quadrangle.

Latitude: 42°33'02" Longitude: 71°49'30"

Remarks:

This site did not meet criteria for this study due to the small contributing drainage area, (273 acres), therefore, no further investigations were made.

SITE NA-0311

Location: On a tributary to Notown Reservoir approximately 2200 feet northeast of Ball Hill in Leominster, Massachusetts.

Fitchburg, Massachusetts Quadrangle.

Latitude: $42^{\circ}31'29''$ Longitude: $71^{\circ}50'11''$

Remarks: This site did not meet criteria for this study due to the small contributing drainage area, (84 acres), therefore, no further investigations were made.

Public Ownership: About 95% of this site is owned by the Massachusetts Department of Natural Resources.

SITE NA-0312

Location: On a tributary to Notown Reservoir approximately 600 feet downstream from Parmenter Street in Leominster, Massachusetts.

Fitchburg, Massachusetts Quadrangle.

Latitude: $42^{\circ}31'02''$ Longitude: $71^{\circ}49'10''$

Remarks: This site did not meet criteria for this study due to the size of the contributing drainage area, (257 acres), therefore, no further investigations were made.

SITE NA-0313

Location: On a tributary to Notown Reservoir approximately 4200 feet downstream from Parmenter Street in Leominster, Massachusetts.

Fitchburg, Massachusetts Quadrangle.

Latitude: $42^{\circ}31'38''$ Longitude: $71^{\circ}49'22''$

Facilities Affected: No facilities affected below elevation 785.

SITE NA-0313 (Cont'd)

Geologic

Conditions:

The left abutment is englacial drift with thin outwash sand and gravel at the surface. The right abutment is englacial drift, silty sand and shallow to bedrock. Depth to bedrock in the foundation is not known, but may be 15 to 20 feet. There is a leakage problem in the left abutment. Impervious borrow material for dam construction is available on site; however, rock greater than 6-inches may run 40 percent. Waterholding capabilities appear to be fair.

Engineering

Notes:

The recommended location for an emergency spillway is at the left abutment. Waterholding capabilities may be improved if a positive cutoff to till or bedrock can be made on the left abutment.

Public

Ownership:

This site is located within the Leominster State Forest.

SITE NA-0314

Location:

On a tributary to Notown Reservoir approximately 700 feet upstream of Granite Street in Leominster, Massachusetts.

Fitchburg, Massachusetts Quadrangle.

Latitude: 42°32'22"

Longitude: 71°48'33"

Remarks:

This site did not meet criteria for this study due to the small contributing drainage area, (220 acres), therefore no further investigations were made.

NA-0315 --HAYNES RESERVOIR

Location: 1500 feet upstream of Parmenter Road
in Leominster, Massachusetts.

Fitchburg, Massachusetts Quadrangle

Latitude: $42^{\circ}30'51''$ Longitude: $71^{\circ}48'10''$

Surface Area
(Acres)

55

Height of Dam
(Ft.)

15

Drainage Area
(Acres) (Sq. Mi.)

274

0.43

Potential
for
Expansion:

Limited by small drainage area.

Remarks:

This is a long earth fill dam. Upstream slope is riprapped. Spillway is about 8 feet wide and is constructed of granite blocks. Condition of the dam is fair to poor. Both slopes are covered with trees and brush.

SITE NA-0316

Location: On a tributary to Rockwell Pond, 1000 feet downstream of Distributing Reservoir in Leominster, Massachusetts.

Fitchburg, Massachusetts Quadrangle.

Latitude: 42°31'45" Longitude: 71°47'03"

Remarks: This is the Monoosnoc Dam proposed in the Army Corps of Engineer's North Nashua Study. For further information on this site see "Water Resource Development Plan -- North Nashua River Basin," U.S. Army Engineer Division, New England Corps of Engineers, Waltham, Massachusetts, January 1965.

Site topography, costs, etc., are presented in the Appendices to the Corps' report.

NA-0317 -- NOTOWN RESERVOIR

Location: 1500 feet south of Route 2 in Leominster,
Massachusetts.

Fitchburg, Massachusetts Quadrangle.

Latitude: $42^{\circ}32'33''$ Longitude: $71^{\circ}49'04''$

<u>Surface Area</u> <u>(Acres)</u>	<u>Height of</u> <u>Dam (Ft.)</u>	<u>Drainage</u> <u>(Acres)</u>	<u>Area</u> <u>(Sq. Mi.)</u>
233	15	2920	4.57

Potential
for
Expansion:

Limited by Route 2 and would require a
long dam.

Remarks:

This is a long earth dam. Upstream slope
has rock riprap. Spillway at left abutment
is about 4 feet deep by 50 feet wide.
The structure is in good condition, but has
some trees and brush along waterline.



SITE NA-0318

Location: On Fa¹ulah Brook approximately 250 feet upstream
of Ashby West Road in Fitchburg, Massachusetts.

Ashby, Massachusetts Quadrangle

Latitude: 42°38'01" Longitude: 71°50'17"

Facilities
Affected:

No facilities affected below elevation 970.

Geologic
Conditions:

Both abutments are thin discontinuous outcrops of silty sand and gravel, glacial till. Depth to schist bedrock in the foundation is not known, but may be 20 to 25 feet. There are no apparent leakage problems. Impervious borrow material for dam construction is available on site; however, rock greater than 6-inches may run 30 percent. Waterholding capabilities appear to be good.

Engineering
Notes:

The recommended location for an emergency spillway is at the left abutment. An additional off-site borrow source will probably be necessary.

NA-0319 -- PIERCE POND

Location: Upstream of Lindell Avenue in Leominster,
Massachusetts.

Fitchburg, Massachusetts Quadrangle.

<u>Surface Area</u> <u>(Acres)</u>	<u>Height of</u> <u>Dam (Ft.)</u>	<u>Drainage</u> <u>(Acres)</u>	<u>Area</u> <u>(Sq.Mi.)</u>
24	25	4416	6.9

Potential
for
Expansion:

Limited by Route 2 and Merriam Street.

Remarks:

This is an earth dam. Spillway is a 50
foot concrete weir with a stone chute.
Overall condition of the dam is fair.
Upstream and downstream slopes are covered
with birch trees. There is some concrete
spalling on both sides of the spillway.



NA-0320 -- ROCKWELL POND

Location: On Monoosnoc Brook in Leominster,
Massachusetts.

Fitchburg, Massachusetts Quadrangle.

<u>Surface Area</u> <u>(Acres)</u>	<u>Height of</u> <u>Dam (Ft.)</u>	<u>Drainage</u> <u>(Acres)</u>	<u>Area</u> <u>(Sq. Mi.)</u>
9	15	5950	9.3

Potential
for
Expansion:

Limited by development on all sides.

Remarks:

Elm Street forms the dam. Spillway is
two 25 foot wide culverts under the road.
All structures are in good condition.



NA-0321 -- OVERLOOK RESERVOIR

Location: 1800 feet upstream of Caldwell Street
in Fitchburg, Massachusetts.

Fitchburg, Massachusetts Quadrangle

<u>Surface Area</u> <u>(Acres)</u>	<u>Height of Dam</u> <u>(Ft.)</u>	<u>Drainage Area</u>	
		<u>(Acres)</u>	<u>(Sq. Mi.)</u>
10	40	40	0.06

Potential
for
Expansion: Limited by need for extensive diking.

Remarks: There is an earth dam at both the north and south ends of the reservoir. This reservoir is a storage basin for the Fitchburg Water System. Water is pumped to the site for storage and use. Condition of the south dam is good. The north dam is covered with trees and in fair condition.

NA-0322 -- GREEN'S POND

Location: On Falulah Brook, just upstream of
Route 31 in Fitchburg, Massachusetts.

Fitchburg, Massachusetts Quadrangle.

<u>Surface Area</u> <u>(Acres)</u>	<u>Height of</u> <u>Dam (Ft.)</u>	<u>Drainage</u> <u>(Acres)</u>	<u>Area</u> <u>(Sq. Mi.)</u>
11	15	4860	7.6

Potential
for

Expansion: Limited by Ashby Road, Fishers Street and
Rindge Road.

Remarks: This is an old stone dam with a concrete
weir type spillway about 8 foot wide.
Condition is poor.



NA-0323 -- MORSE RESERVOIR

Location: Upstream of Elm Street in Leominster,
Massachusetts.

Fitchburg, Massachusetts Quadrangle.

<u>Surface Area</u> <u>(Acres)</u>	<u>Height of</u> <u>Dam (Ft.)</u>	<u>Drainage</u> <u>(Acres)</u>	<u>Area</u> <u>(Sq. Mi.)</u>
11	30	180	0.28

Potential
for
Expansion:

Limited by small drainage area.

Remarks:

Elm Street forms the dam, the upstream slope is riprapped. There is an open spillway culvert under Elm Street 25 feet wide by 6-inches high. There appears to be some seepage at the downstream slope, but overall condition appears good.



NA-0324 -- LOVELL RESERVOIR

Location: On Falulah Brook about 700 feet upstream
of Scott Brook in Fitchburg, Massachusetts.

Fitchburg, Massachusetts Quadrangle.

<u>Surface Area</u> <u>(Acres)</u>	<u>Height of</u> <u>Dam (Ft.)</u>	<u>Drainage</u> <u>(Acres)</u>	<u>Area</u> <u>(Sq. Mi.)</u>
34	80	2070	3.24

Potential
for

Expansion: Steep topography limits further development.

Remarks: This site is part of the Fitchburg Water Supply. The earth dam has a 75 foot wide concrete spillway at the right abutment leading to a paved chute; the dam has a rock paved berm at the 40 foot level on the downstream face. The upstream face is rock riprapped. There is a long dike along the left bank. The dam and spillway are in good condition.



NA-0325 -- SCOTT RESERVOIR

Location: On Scott Brook about 500 feet upstream
of Ashby West Road in Fitchburg, Massachusetts.

Fitchburg, Massachusetts Quadrangle

<u>Surface Area</u> <u>(Acres)</u>	<u>Height of Dam</u> <u>(Ft.)</u>	<u>Drainage Area</u>	
		<u>(Acres)</u>	<u>(Sq. Mi.)</u>
31	30	470	0.73

Potential
for

Expansion: Expansion would affect Ashby West Road.
Drainage area will limit further development.

Remarks: This is an earth dam with a 30 foot wide
weir spillway on the left abutment with a
paved rock outlet channel. The upstream
slope of the dam is rock riprapped. Some
brush is growing on slopes. Abutments
appear gravelly.

NA-0326 -- BAKER POND

Location: Upstream of Summer Street in Lunenburg,
Massachusetts.

Fitchburg, Massachusetts Quadrangle.

Remarks: There is no dam or structure at Baker Pond.
It appears to be a shallow natural depression.
Future development is restricted by drive-in
theatre and shopping center. The pond is being
filled in and used as a dump. No photograph
was taken at this site.

NA-0327 -- SMITH POND

Location: On Monoosnoc Brook, 300 feet upstream of
Granite Street in Leominster, Massachusetts.

Fitchburg, Massachusetts Quadrangle.

Remarks: The old dam with granite block spillway is no
longer impounding water. The entire structure
is in poor condition. No photograph was taken
at this site.

SUMMARY DATA FOR POTENTIAL UPSTREAM RESERVOIR SITES

STUDY AREA-NASHUA RIVER															SUBWATERSHED-NASHUA RIVER														
BENEFICIAL POOL															EMERGENCY SPILLWAY														
ELEV	STORAGE	PER AC FT	AREA (AC)	SURF AC	COST/AC	DEPTH (FT)	AT DAM	CREST	ELEV	STORAGE	COST	PER AC FT	ELEV	AREA	DESIGN HIGH WATER	DAM	SAFE YIELD												
(MSL)	AC FT	IN	(\$)	(\$)				(MSL)	AC FT	IN	(\$)	AC FT	PER	ELEV	AREA	TOP	HGT	FILL	CHANCE										
USGS QUAD- ASHBY MASS-NH															USGS QUAD- ASHBY MASS-NH														
DA= 0.50 SQ MI = 320 AC															DA= 0.50 SQ MI = 320 AC														
STREAM WATER QUALITY (A)															STREAM WATER QUALITY (A)														
100-YR PRIN SPWY DESIGN STORM															100-YR PRIN SPWY DESIGN STORM														
RUNOFF = 8.10 IN, PEAK FLOW = 151 CFS															RUNOFF = 8.10 IN, PEAK FLOW = 151 CFS														
LATITUDE 42-38-04															LATITUDE 42-38-04														
LONGITUDE 71-50-44															LONGITUDE 71-50-44														
SITE RATING (1)															SITE RATING (1)														
975.8	0	0.0	2	41350	16.4	2.8	989.9	E	111	4.1	3990	14	994.9	22	29	0.17	0.25	0.34	0.40										
989.4	100	3.8	5130	12	41350	16.4	991.9	E	137	5.1	3750	14	996.0	23	33	0.17	0.25	0.34	0.40										
997.4	213	8.0	3020	16	41290	24.4	999.9	E	257	9.6	2500	1002.1	20	1003.9	31	73	0.17	0.25	0.34										
1005.9	383	14.3	2200	26	31960	32.9	1008.4	E	458	17.2	1840	1010.6	34	1013.0	40	147	0.34	0.40	0.42										
1013.0	610	22.9	1680	36	28530	40.0	1015.5	E	707	26.5	1450	1017.8	40	1020.4	47	229	0.40	0.42	0.42										
1014.5	667	25.0	1610	37	28720	41.5	1017.0	E	767	28.7	1400	1019.1	42	1021.8	49	248	0.42	0.42	0.42										

DA= 0.60 SQ MI = 384 AC															DA= 0.60 SQ MI = 384 AC														
USGS QUAD- ASHBY MASS-NH															USGS QUAD- ASHBY MASS-NH														
100-YR PRIN SPWY DESIGN STORM															100-YR PRIN SPWY DESIGN STORM														
RUNOFF = 8.10 IN, PEAK FLOW = 181 CFS															RUNOFF = 8.10 IN, PEAK FLOW = 181 CFS														
LATITUDE 42-37-54															LATITUDE 42-37-54														
LONGITUDE 71-48-13															LONGITUDE 71-48-13														
SITE RATING (1)															SITE RATING (1)														
775.0	0	0.0	2	33910	19.2	5.0	791.0	E	133	4.1	3380	18	796.8	27	46	0.18	0.29	0.34	0.40										
789.3	100	3.0	5010	15	33910	19.2	791.8	E	145	4.5	3450	19	796.0	26	44	0.18	0.29	0.34	0.40										
797.0	240	7.5	2750	21	31740	27.0	799.5	E	299	9.3	2210	802.0	25	804.3	34	91	0.29	0.34	0.40										
805.5	450	14.1	1890	29	29200	35.5	808.0	E	531	16.6	1600	810.5	34	813.0	43	171	0.40	0.42	0.42										
814.0	730	22.7	1490	37	29130	44.0	816.5	E	831	26.0	1310	818.8	41	821.5	51	277	0.40	0.42	0.42										
815.8	800	25.0	1420	39	29370	45.8	818.3	E	904	28.2	1260	820.5	43	823.1	53	303	0.50	0.50	0.50										

DA= 1.30 SQ MI = 832 AC															DA= 1.30 SQ MI = 832 AC														
USGS QUAD- FITCHBURG MASS															USGS QUAD- FITCHBURG MASS														
100-YR PRIN SPWY DESIGN STORM															100-YR PRIN SPWY DESIGN STORM														
RUNOFF = 8.10 IN, PEAK FLOW = 392 CFS															RUNOFF = 8.10 IN, PEAK FLOW = 392 CFS														
LATITUDE 42-36-30															LATITUDE 42-36-30														
LONGITUDE 71-46-11															LONGITUDE 71-46-11														
SITE RATING (3)															SITE RATING (3)														
463.5	0	0.0	5	23240	11.8	3.5	477.4	E	288	4.1	1780	52	483.0	23	19	0.24	0.34	0.40	0.42										
471.7	100	1.4	4950	21	23240	11.8	476.2	E	243	3.5	2040	47	480.7	21	15	0.24	0.34	0.40	0.42										
480.5	427	6.1	1450	53	11660	20.5	483.0	E	576	8.3	1080	485.5	61	487.9	28	31	0.56	0.62	0.68										
488.7	917	13.2	1040	66	14420	28.7	491.2	E	1108	16.0	860	493.7	94	496.2	36	62	0.84	0.90	0.96										
496.2	1570	22.6	910	113	12710	36.2	498.7	E	1883	27.2	760	500.7	146	504.2	44	105	1.05	1.11	1.17										
497.5	1733	25.0	920	123	13050	37.5	500.0	E	2067	29.7	770	501.7	156	505.2	45	111	1.08	1.14	1.20										

NOTES - (1) COSTS ARE BASED ON 1971 S.C.S. DESIGN CRITERIA AND COST DATA.																													
(2) EMERGENCY SPILLWAY STORAGE AND COSTS ARE BASED ON TOTAL STORAGE, INCLUDING BENEFICIAL POOL.																													
(3) EMERGENCY SPILLWAY TYPE CODE- C=CONCRETE CHUTE, D=CONCRETE DROP, E=EXCAVATED, T= TWO SPILLWAYS, N= NONE																													
(4) TABULAR DATA ARE BASED ON PRELIMINARY INFORMATION. FIGURES SHOWN ARE PRIMARILY FOR COMPARISON PURPOSES.																													
(5) ELEVATIONS ARE SHOWN TO THE NEAREST 0.1 FOOT TO SHOW VARIATION BETWEEN DEVELOPMENTS ONLY, AND ARE NOT TO BE CONSIDERED ACCURATE TO THAT DEGREE.																													

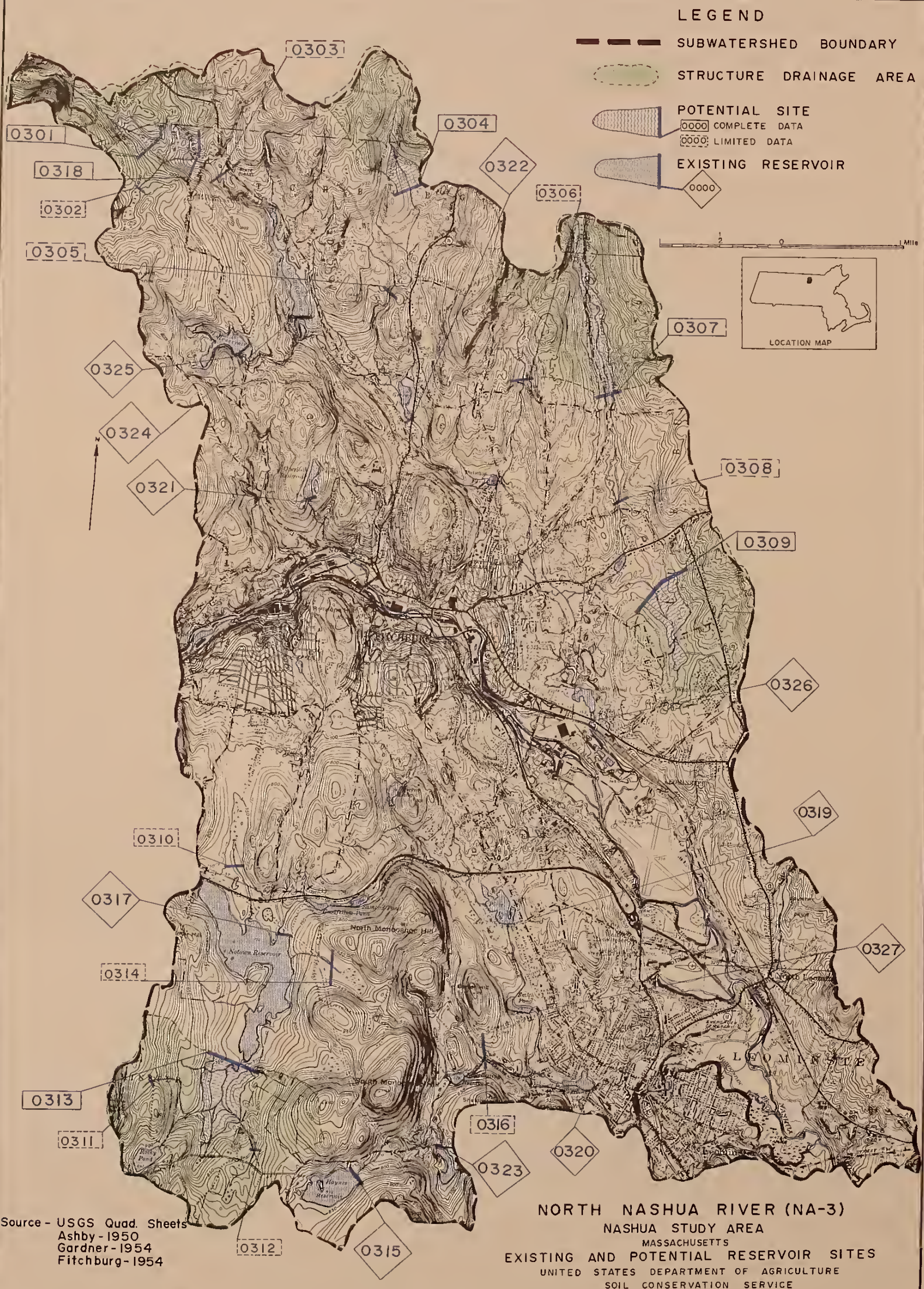
DO NOT USE FOR FINAL SITE SELECTION OR LAND ACQUISITION.

SUMMARY DATA FOR POTENTIAL UPSTREAM RESERVOIR SITES

STUDY AREA-NASHUA RIVER										SUBWATERSHED-NASHUA RIVER									
BENEFICIAL POOL										EMERGENCY SPILLWAY									
COST										DESIGN									
PER AC FT										HIGH WATER									
STORAGE										DAM									
AT SURF AC										ELEV									
DEPTH										AREA									
COST/										ELEV									
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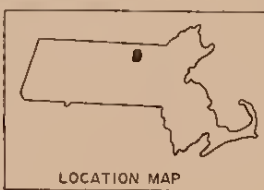
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Notes



LEGEND

- SUBWATERSHED BOUNDARY
- STRUCTURE DRAINAGE AREA
- POTENTIAL SITE
 - COMPLETE DATA
 - LIMITED DATA
- EXISTING RESERVOIR



Source - USGS Quad. Sheets
Ashby - 1950
Gardner - 1954
Fitchburg - 1954

NORTH NASHUA RIVER (NA-3)
NASHUA STUDY AREA
MASSACHUSETTS
EXISTING AND POTENTIAL RESERVOIR SITES
UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

NASHUA STUDY AREA
SITE DATA FOR

Subwatershed NA-4, Nashua River

This subwatershed covers about 20,900 acres in the Towns of Lancaster, Leominster and Sterling, all in Worcester County. Fort Devens, a U. S. Army installation is partially within the subwatershed. The main streams are Wekepeke Brook; which originates above Fall Brook Reservoir in Leominster and flows generally easterly to the North Nashua River in Lancaster; and a portion of the North Nashua River which flows south easterly from Leominster to its confluence with the Nashua River in Lancaster. Elevations range from a high of about 1070 on Bayberry Hill to about 290 in Lancaster. Geology within the subwatershed is characterized by schist bedrock at depths of 15 to 50 feet, overlain by outwash sand and gravel.

Nineteen potential reservoir sites and two existing reservoirs were studied. Design summaries are included for eight potential sites that met study criteria.

SITE NA-0401

Location: On Fall Brook approximately 200 feet upstream
of Wachusett Street in Leominster, Massachusetts.
Fitchburg, Massachusetts Quadrangle.

Latitude: 42°30'03" Longitude: 71°47'39"

Remarks: This site did not meet criteria for this study
due to the small contributing drainage area,
(279 acres); therefore, no further investigations
were made.

NA-0402 -- LEOMINSTER RECREATION AREA

LOCATION: 1600 feet upstream of Chestnut Street
in Leominster, Massachusetts.

Fitchburg, Massachusetts Quadrangle.

Latitude: $42^{\circ}31'17''$ Longitude: $71^{\circ}46'23''$

<u>Surface Area</u> <u>(Acres)</u>	<u>Height of</u> <u>Dam (Ft.)</u>	<u>Drainage</u> <u>(Acres)</u>	<u>Area</u> <u>(Sq. Mi.)</u>
7	25	340	0.53

Potential
for
Expansion:

Site could be expanded, but the small
drainage area would be a limiting factor.

Remarks:

This is an earth dam. Upstream slope is
protected by mortared riprap. There are
two spillways, a pipe spillway with riser
and a concrete box culvert at the right
abutment. Entire structure is in good
condition.

Geologic
Conditions:

The right abutment is schist bedrock. The
left abutment is silty sand and gravel with
cobbles and boulders -- dense glacial till.
There is schist bedrock at the surface in the
foundation. There are no apparent leakage
problems. Impervious borrow material for dam
construction is available on site; however,
it contains cobbles and boulders. Waterholding
capabilities appear to be good.



SITE NA-0403

Location: On Fall Brook approximately 100 feet upstream
of Penn Central Railroad in Leominster,
Massachusetts.

Shirley, Massachusetts Quadrangle.

Latitude: $42^{\circ}30'32''$ Longitude: $71^{\circ}44'48''$

Facilities
Affected: No facilities affected below Elevation 355.

Geologic
Conditions: Both abutments are poorly graded sand and gravel
outwash with swamp at low elevations. Depth to
bedrock in the foundation is not known. There
are leakage problems in both abutments and the
foundation. Impervious borrow material for dam
construction was not located on site. Water-
holding capabilities appear poor.

Engineering
Notes: The recommended location for an excavated emergency
spillway is at the right abutment. Waterholding
capabilities appear to be poor due to outwash on
both abutments and swamp across the foundation.
Preliminary structure designs indicated that a con-
crete emergency spillway (drop structure) will
probably be needed to avoid excessive velocity in
an excavated emergency spillway.

SITE NA-0404

Location: On a tributary to Heywood Reservoir approximately
1800 feet upstream from May Street in Sterling,
Massachusetts.

Sterling, Massachusetts Quadrangle.

Latitude: $42^{\circ}29'03''$ Longitude: $71^{\circ}47'35''$

Remarks: This site did not meet criteria for this study
due to the small contributing drainage area,
(128 acres); therefore, no further investigations
were made.

NA-0405 -- HEYWOOD RESERVOIR

Location: On Wekepeke Brook, 1500 feet upstream
of North Row, in Sterling, Massachusetts.

Sterling, Massachusetts Quadrangle

Latitude: 42°28'49" Longitude: 71°46'53"

<u>Surface Area</u> <u>(Acres)</u>	<u>Height of Dam</u> <u>(Ft.)</u>	<u>Drainage Area</u>	
		<u>(Acres)</u>	<u>(Sq. Mi.)</u>
36	40	474	0.74

Potential
for
Expansion: Further development would be limited by the
small drainage area.

Remarks: This is an earth-fill dam with rock riprap
on the upstream face. Principal spillway
is a pipe outlet. Emergency spillway is a
15 foot wide concrete weir.

Geologic
Conditions: Both abutments are silty sand glacial till
with cobbles and boulders. . Depth to schist
bedrock in foundation not known, but may be
40 to 50 feet. There are no apparent
leakage problems. Impervious borrow material
for dam construction is available on site;
however, it contains cobbles and boulders.
Waterholding capabilities appear to be good.

SITE NA-0406

Location: Approximately 1000 feet upstream from Fitch Basin in Sterling, Massachusetts.

Sterling, Massachusetts Quadrangle.

Latitude: 42°28'01" Longitude: 71°47'20"

Remarks: This site did not meet criteria for this study due to the small contributing drainage area, (133 acres); therefore no further investigations were made.

SITE NA-0407

Location: On Lynde Brook approximately 1500 feet downstream from Tuttle Road in Sterling, Massachusetts.

Sterling, Massachusetts Quadrangle

Latitude: 42°28'07" Longitude: 71°46'28"

Facilities Affected: Below elevation 610
1 barn
1200 feet of Tuttle Road

Geologic Conditions: Both abutments are fine, poorly graded sand outwash with some gravel. Depth to schist bedrock in the foundation is not known, but may be 40 to 50 feet. There are leakage problems in both abutments and possibly in the foundation. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear poor.

Engineering Notes: The recommended location for an emergency spillway is at the right abutment.

Public Ownership: About 15% of the site is owned by the Town of Clinton.

SITE NA-0408

Location: On Wekepeke Brook approximately 2600 feet
upstream from Route 12 in Sterling,
Massachusetts.

Sterling, Massachusetts Qudrangle.

Latitude: 42°28'12" Longitude: 71°45'22"

Facilities

Affected:

Below elevation 535

2 houses

1 pump house

2050 feet of double wood-pole power lines

1500 feet of North Row

Below elevation 530

2 houses

1750 feet of double wood-pole power lines

900 feet of North Row

Below elevation 520

1050 feet of double wood-pole power lines

350 feet of North Row

Geologic

Conditions:

Both abutments are outwash sand and gravel and may be shallow to till or bedrock. There are bedrock outcrops high on the left abutment. Depth to schist bedrock in the foundation is not known, but may be 15 to 25 feet. There are leakage problems in both abutments and possibly in the foundation. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear fair.

Engineering

Notes:

The recommended location for an emergency spillway is at the right abutment. Waterholding capabilities may be improved if a positive cutoff can be made.

Public

Ownership:

About 30% of the site area is owned by the Town of Clinton.

SITE NA-0409

Location: On a tributary to Wekepeke Brook approximately 3000 feet upstream from Route 12 in Sterling, Massachusetts.

Sterling, Massachusetts Quadrangle.

Latitude: $42^{\circ}27'31''$ Longitude: $71^{\circ}45'18''$

Engineering
Notes:

This site did not meet criteria for this study due to the small contributing drainage area, (162 acres); therefore no further investigations were made.

SITE NA-0410

Location: On Wekepeke Brook approximately 100 feet upstream of Penn Central Railroad in Sterling, Massachusetts.

Clinton, Massachusetts Quadrangle.

Latitude: $42^{\circ}27'27''$ Longitude: $71^{\circ}44'28''$

Facilities
Affected:

No facilities affected below elevation 410.

Geologic
Conditions:

Both abutments are poorly graded sand and gravel outwash. Depth to schist bedrock in the foundation is not known, but may be 25 to 35 feet. There are leakage problems on both abutments. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear poor.

Engineering
Notes:

The recommended location for an excavated emergency spillway is at the left abutment. Preliminary structure designs indicate that a concrete emergency spillway (monolithic conduit) will probably be needed to avoid excessive velocity in an excavated emergency spillway.

Public
Ownership:

This site is owned by the Town of Clinton.

SITE NA-0411

Location: On Wekepeke Brook approximately 1100 feet upstream from Flanagan Hill Road in Sterling, Massachusetts.

Clinton, Massachusetts Quadrangle.

Latitude: $42^{\circ}27'58''$ Longitude: $71^{\circ}44'12''$

Facilities

Affected:

Below elevation 400

100 duck shelters

town barn

Pratt Junction Road,

Flanagan Road

Below elevation 375

100 duck shelters

Pratt Junction Road

Flanagan Road

Below elevation 390

100 duck shelters

Pratt Junction Road,

Flanagan Road

Geologic

Conditions:

Both abutments are poorly graded sand and gravel outwash. There are stream terrace deposits low on the left abutment. It is swampy across the entire foundation area. Depth to schist bedrock in the foundation is not known, but may be 40 to 50 feet. There are leakage problems in both abutments and the foundation. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear to be poor.

Engineering

Notes:

The recommended location for an emergency spillway is at the right abutment. Preliminary structure designs indicate that a concrete chute emergency spillway will probably be required to avoid excessive velocity in an excavated emergency spillway.

Public

Ownership:

About 80% of this site is owned by the Town of Clinton.

SITE NA-0412

Location: On a tributary to Wekepeke Brook approximately
900 feet downstream from Jungle Road in
Lancaster, Massachusetts.

Clinton, Massachusetts Quadrangle.

Latitude: $42^{\circ}28'42''$ Longitude: $71^{\circ}43'36''$

Facilities
Affected: This site was eliminated from further study due
to high facility costs. Pumping station and
overhead powerlines are in the pool area.

Geologic
Conditions: Both abutments are poorly graded sand and gravel
outwash. Depth to schist bedrock in the founda-
tion is not known, but may be 15 to 25 feet.
There are leakage problems in both abutments and
the foundation. Impervious borrow material for
dam construction was not located on site. Water-
holding capabilities appear to be poor.

Engineering
Notes: The recommended location for an emergency spillway
is at the right abutment.

Public
Ownership: About 80% of this site is owned by the Town of Clinton.

SITE NA-0413

Location: On a tributary to Wekepeke Brook approximately
300 feet upstream from Jungle Road in Leominster,
Massachusetts.

Clinton, Massachusetts Quadrangle.

Latitude: $42^{\circ}28'57''$ Longitude: $71^{\circ}43'53''$

Remarks: This site did not meet criteria for this study
due to the small contributing drainage area,
(354 acres), and facilities affected (railroad
and powerlines); therefore no further investigations
were made.

SITE NA-0414

Location: On a tributary to Wekepeke Brook approximately 3800 feet downstream from Brockelman Road in Sterling, Massachusetts.

Clinton, Massachusetts Quadrangle.

Latitude: $42^{\circ}28'19''$ Longitude: $71^{\circ}43'15''$

Remarks:

This site did not meet criteria for this study due to the small contributing drainage area, (160 acres); therefore no further investigations were made.

SITE NA-0415

Location: On a tributary to Wekepeke Brook approximately 4800 feet upstream from Bartlett Pond in Lancaster, Massachusetts.

Clinton, Massachusetts Quadrangle.

Latitude: $42^{\circ}28'29''$ Longitude: $71^{\circ}42'53''$

Remarks:

This site did not meet criteria for this study due to the small contributing drainage area, (136 acres); therefore no further investigations were made.

SITE NA-0416

Location: On a tributary to Wekepeke Brook approximately 3000 feet upstream from Brockelman Road in Lancaster, Massachusetts.

Clinton, Massachusetts Quadrangle.

Latitude: 42°28'19" Longitude: 71°42'31"

Facilities

Affected: No facilities affected below elevation 390.

Geologic

Conditions: The left abutment is poorly graded sand and gravel outwash, very shallow to schist bedrock with outcrops at high elevations and swamp at low elevations. The right abutment is thin, poorly graded sand and gravel outwash with schist outcrops. Depth to schist or phyllite bedrock in the foundation is not known, but may be 15 to 25 feet. There are leakage problems in both abutments and the foundation. Impervious borrow material for dam construction is available on site; however, rock greater than 6-inches may run 40 percent. Waterholding capabilities appear to be poor.

Engineering

Notes: The recommended location for an emergency spillway is at the right abutment. Waterholding capabilities may be fair if a positive cutoff to bedrock is made on both abutments and the foundation.

SITE NA-0417

Location: On a tributary to the Nashua River approximately 2810 feet upstream from Langen Road in Lancaster, Massachusetts.

Clinton, Massachusetts Quadrangle.

Latitude: 42°27'16" Longitude: 71°41'57"

Engineering

Notes: This site did not meet criteria for this study due to the small contributing drainage area, (262 acres); therefore, no further investigations were made.

SITE NA-0418

Location: On Runaway Brook near junction of town boundaries for Clinton, Lancaster, and Bolton, in Bolton, Massachusetts.

Clinton, Massachusetts Quadrangle

Latitude: $42^{\circ}25'46''$ Longitude: $71^{\circ}39'28''$

Remarks: This site did not meet criteria for this study due to the small contributing drainage area, (257 acres); therefore, no further investigations were made.

SITE NA-0419

Location: On a tributary to the Nashua River approximately 500 feet upstream from High Street in Lancaster, Massachusetts.

Clinton, Massachusetts Quadrangle

Latitude: $42^{\circ}26'31''$ Longitude: $71^{\circ}40'01''$

Facilities
Affected:

Below Elevation 270

12 houses
turkey farm
3 barns
2800 feet of Mill Street

Below Elevation 265

8 houses
turkey farm
3 barns

Below Elevation 260

1 house
turkey farm
2 barns

Below Elevation 255

turkey farm

Geologic
Conditions:

Both abutments are poorly graded sand and gravel outwash, with swamps at lower elevations. Depth to bedrock in the foundation is not known. There are leakage problems on both abutments and the foundation. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear poor.

SITE NA-0419 (Cont'd)

Engineering
Notes:

The recommended location for an emergency spillway is at the left abutment.

Public
Ownership:

The Massachusetts Department of Correction owns 20% of the site. The remaining area is owned by the Town of Clinton.

SITE NA-0420

Location:

On Ponakin Brook approximately 2400 feet downstream from Shoefelt Road on Fort Devens Military Reservation in Lancaster, Massachusetts.

Clinton, Massachusetts Quadrangle.

Latitude: 42°29'05" Longitude: 71°40'14"

Facilities
Affected:

This site is located in the gunnery impact area of the Fort Devens Military Reservation; therefore, no further investigations were made.

Geologic
Conditions:

Both abutments are poorly graded sand and gravel outwash. Depth to phyllite bedrock in the foundation is not known, but may be 15 to 25 feet. There are leakage problems in both abutments. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear to be poor.

Engineering
Notes:

The recommended location for an emergency spillway is at the right abutment.

Public
Ownership:

The entire site is owned by the U. S. Army.

SITE NA-0421

Location: On Wekepeke Brook approximately 1100 feet upstream from North Main Street in Lancaster, Massachusetts.

Clinton, Massachusetts Quadrangle

Latitude: 42°29'10" Longitude: 71°43'02"

Facilities

Affected: No affected facilities below elevation 320

Geologic

Conditions: The left abutment is poorly graded sand and gravel outwash, with swamp, outwash, and stream terrace deposits at the low elevations. The right abutment is poorly graded sand and gravel outwash, probably shallow to schist bedrock. Depth to schist bedrock in the foundation is not known, but may be 15 to 25 feet. There are leakage problems in both abutments and the foundation. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear to be poor.

Engineering

Notes: The recommended location for an excavated emergency spillway is at the left abutment. Preliminary structure designs indicate that a concrete chute emergency spillway will probably be needed to avoid excessive velocity in an excavated emergency spillway.

Public

Ownership: The Town of Clinton owns about 10% of the site.

NA-0422 -- FALL BROOK RESERVOIR

Location: On Fall Brook about 1000 feet upstream
of Pleasant Street in Leominster,
Massachusetts.

Sterling, Massachusetts Quadrangle

<u>Surface Area</u> <u>(Acres)</u>	<u>Height of</u> <u>Dam (Ft.)</u>	<u>Drainage</u> <u>(Acres)</u>	<u>Area</u> <u>(Sq. Mi.)</u>
76	30	820	1.28

Potential
for
Expansion:

Development would require a long dam and
a dike at the southern end of the reservoir.
Small drainage area may limit further expansion.

Remarks:

This is a part of the Leominster Water
Supply. The emergency spillway at the
right abutment is about 25 feet wide and
6 feet deep. Structure is a long earth-
fill dam with riprap on the upstream slope.
The dam has trees and brush growing on
the downstream slope.



NA-0423 -- LAKE SAMOSET

Location: On Fall Brook about 300 feet upstream of
Grant Street in Leominster, Massachusetts.

Sterling, Massachusetts Quadrangle

<u>Surface Area</u> <u>(Acres)</u>	<u>Height of Dam</u> <u>(Ft.)</u>	<u>Drainage Area</u>	
		<u>(Acres)</u>	<u>(Sq. Mi.)</u>
38	20	1640	2.56

Potential
for
Expansion:

Further development would be limited by
cottages located around the lake.

Remarks:

This is an earth-fill dam with a 20 foot
wide, 5 foot deep granite block weir
spillway. There are trees growing on the
fill.

SUMMARY DATA FOR POTENTIAL UPSTREAM RESERVOIR SITES

STUDY AREA-NASHUA RIVER										SUBWATERSHED-NASHUA RIVER									
BENEFICIAL POOL																			

SUMMARY DATA FOR POTENTIAL UPSTREAM RESERVOIR SITES

STUDY AREA-NASHUA RIVER SUBWATERSHED-NASHUA RIVER

BENEFICIAL POOL

 * EMERGENCY SPILLWAY * DESIGN * HIGH WATER * DAM * SAFE * YIELD
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NOTES - (1) COSTS ARE BASED ON 1971 S.C.S. DESIGN CRITERIA AND COST DATA.

(2) EMERGENCY SPILLWAY STORAGE AND COSTS ARE BASED ON TOTAL STORAGE, INCLUDING BENEFICIAL POOL.

(3) EMERGENCY SPILLWAY TYPE CODE- C=CONCRETE CHUTE, D=CONCRETE DROP, E=EXCAVATED, T= TWO SPILLWAYS, N= NONE

(4) TABULAR DATA ARE BASED ON PRELIMINARY INFORMATION. FIGURES SHOWN ARE PRIMARILY FOR COMPARISON PURPOSES.

(5) ELEVATIONS ARE SHOWN TO THE NEAREST 0.1 FOOT TO SHOW VARIATION BETWEEN DEVELOPMENTS ONLY, AND ARE NOT TO BE CONSIDERED ACCURATE TO THAT DEGREE.

** DO NOT USE FOR FINAL SITE SELECTION OR LAND ACQUISITION. **

NA-0411

DA= 7.18 SQ MI = 4595 AC USGS QUAD- CLINTON MASS LATITUDE 42-27-58 LONGITUDE 71-44-12
 SITE RATING (3) STREAM WATER QUALITY (B) 100-YR PRIN SPWY DESIGN STORM RUNOFF = 8.20 IN, PEAK FLOW = 2194 CFS

381.5 100 0.3 22420 19 116780 21.5 * 381.5 T 157 0.4 14240 * 396.2 50 * 399.7 40 105 * 0.41

385.0 171 0.4 12220 21 98910 25.0 * 385.0 T 229 0.6 9150 * 396.0 49 * 399.0 39 101 * 0.59

388.2 242 0.6 8930 23 94370 28.2 * 388.2 T 300 0.8 7220 * 396.9 52 * 399.9 40 106 * 0.75

392.2 349 0.8 6540 33 69600 32.2 * 392.2 T 407 1.1 5620 * 397.6 55 * 400.0 40 106 * 0.98

392.5 359 0.8 6300 34 66190 32.5 * 392.5 T 417 1.1 5430 * 397.7 56 * 400.0 40 106 * 1.00

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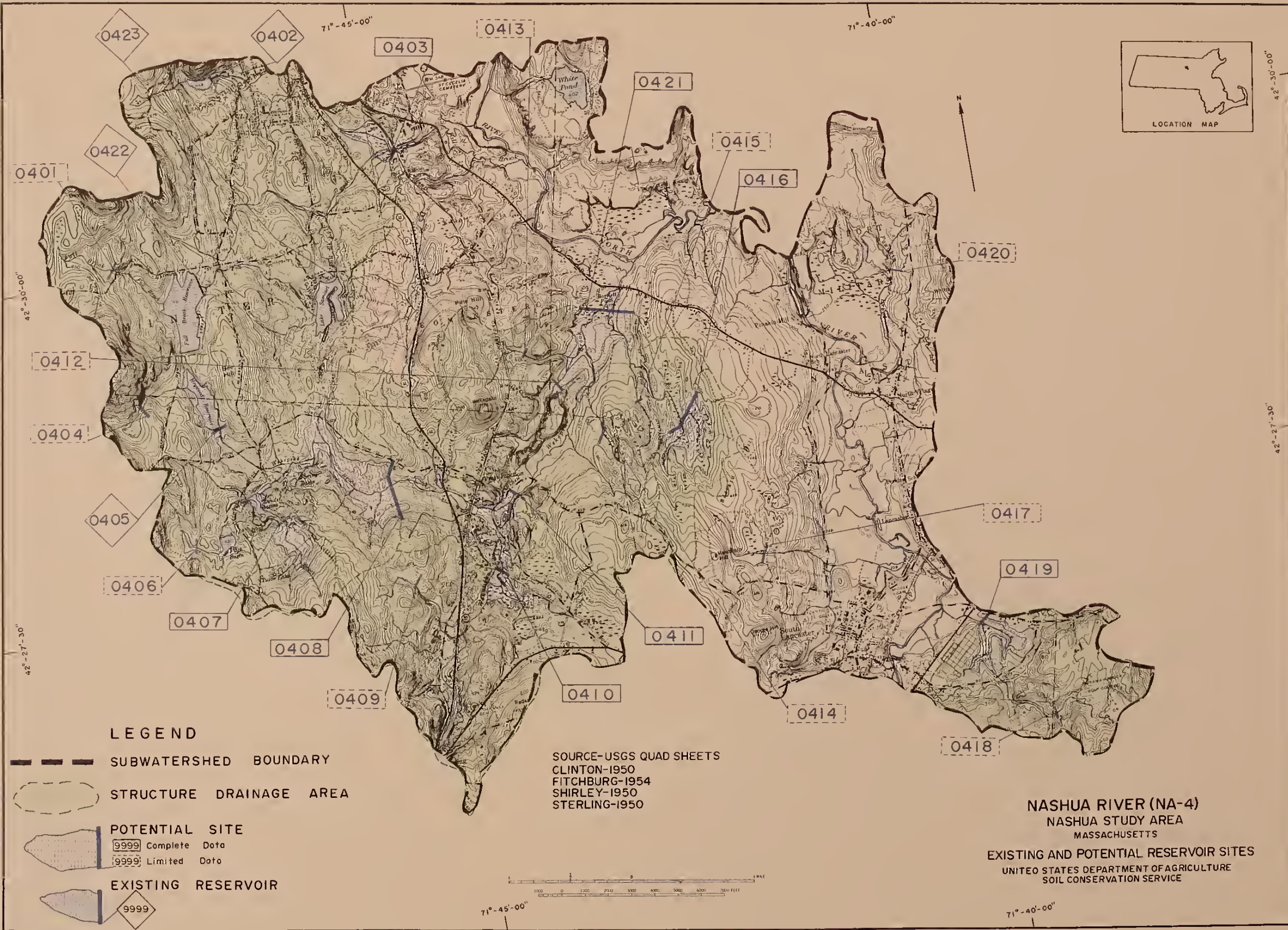
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SUMMARY DATA FOR POTENTIAL UPSTREAM RESERVOIR SITES

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BENEFICIAL POOL										*****									
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Notes



NASHUA STUDY AREA
SITE DATA FOR

Subwatershed NA-5, Quinapoxet River

The Quinapoxet River subwatershed covers about 35200 acres in Holden, Paxton, Princeton, Rutland, Sterling, West Boylston and Worcester; all in Worcester County.

The main stream in this subwatershed is the Quinapoxet River which originates in Princeton and flows southeasterly through Holden and West Boylston, ending at Wachusett Reservoir. Elevations range from a high of about 1300 on Brown Hill to about 410 in Holden. Geology within the Quinapoxet River subwatershed is predominantly characterized by schist bedrock at depths of 5 to 25 feet, overlain by glacial till or outwash sand and gravel.

Twenty six potential reservoir sites and 12 existing reservoirs were studied. Preliminary design summaries are included for 19 potential sites that met study criteria.

SITE NA-0501

Location: On South Wachusett Brook approximately 1900 feet upstream from Hubbardston Road in Princeton, Massachusetts.

Wachusett Mountain, Massachusetts Quadrangle.

Latitude: 42°27'08" Longitude: 71°55'07"

Facilities

Affected: Below elevation 1030
2700 feet of Goodnow Road

Geologic

Conditions: Both abutments are silty sand, glacial till. Depth to schist bedrock in the foundation is not known, but may be 30 to 40 feet. There are no apparent leakage problems, but swamp foundation could be bad. Impervious borrow material for dam construction is available on site, however, it contains cobbles and boulders. Waterholding capabilities appear good.

Engineering

Notes: The recommended location for an emergency spillway is at the right abutment.

SITE NA-0502

Location: On South Wachusett Brook approximately 900 feet upstream from Calamint Hill Road in Princeton, Massachusetts.

Wachusett Mountain, Massachusetts Quadrangle.

Latitude: $42^{\circ}25'52''$ Longitude: $71^{\circ}54'32''$

Facilities Affected: No affected facilities below elevation 880.

Geologic Conditions: Both abutments are poorly graded sand and gravel with about 20 percent cobbles. Depth to bedrock in the foundation is not known, but may be 10 to 15 feet. There is a leakage problem in both abutments. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear poor.

Engineering Notes: The recommended location for an emergency spillway is at the left abutment. Waterholding capabilities may be improved if a positive cutoff to bedrock can be made.

SITE NA-0503

Location: On Cobb Brook approximately 900 feet upstream from Brooks Station Road in Princeton, Massachusetts.

Wachusett Mountain, Massachusetts Quadrangle.

Latitude: $42^{\circ}26'15''$ Longitude: $71^{\circ}53'30''$

Facilities Affected: No affected facilities below Elevation 970.

SITE NA-0503 (Cont'd)

Geologic

Conditions:

Both abutments are silty sand with cobbles and large boulders, glacial till and shallow to granitic bedrock. Depth to granitic bedrock in the foundation is not known, but may be 5 to 10 feet. There are no apparent leakage problems. Impervious borrow material for dam construction is available on site; however, rock greater than 6-inches may run 40 percent. About 50 percent of the foundation is covered with boulders with a diameter greater than 3 feet, many of these with a diameter of 12 to 15 feet. Waterholding capabilities appear to be good.

Engineering

Notes:

The recommended location for an emergency spillway is at the right abutment.

SITE NO NA-0504

Location:

On Cobb Brook approximately 1100 feet upstream from Cobb Brook Road in Princeton, Massachusetts.

Wachusett Mountain, Massachusetts Quadrangle.

Latitude: 42°25'13" Longitude: 71°53'20"

Facilities

Affected:

No affected facilities below elevation 885.

Geologic

Conditions:

The right abutment is silty sand and gravel with cobbles and boulders and shallow to bedrock. The left abutment is outwash sand and gravel at the toe, with glacial till and bedrock high on the abutment. Depth to bedrock in the foundation is not known, but may be 15 to 25 feet. There are leakage problems on the left abutment. Impervious borrow material for dam construction was not located on site in sufficient quantity. Waterholding capabilities appear to be fair.

Engineering

Notes:

The recommended location for an emergency spillway is at the right abutment. Waterholding capabilities may be improved if a positive cutoff can be made through the terrace on the left abutment.

Public

Ownership:

About 5% of the site is owned by the City of Worcester.

SITE NA-0505

Location: On South Wachusett Brook approximately 1500 feet upstream from Old Mill Road in Princeton, Massachusetts.

Wachusett Mountain, Massachusetts Quadrangle.

Latitude: 42°24'40" Longitude: 71°53'27"

Facilities

Affected:

Below elevation 780

3 houses
10 sheds
3200 feet of powerlines
3600 feet of Brooks Road
750 feet of Brooks Station Road

Below elevation 775

2 houses
9 sheds
3200 feet of powerlines
750 feet of Brooks Station Road

Geologic

Conditions:

The left abutment is outwash sand or gravel with many cobbles. The right abutment is poorly graded sand or gravel with many cobbles, but silty in some areas. Depth to schist bedrock in the foundation is not known, but may be 15 to 25 feet. There are possible leakage problems in both abutments and the foundation. Impervious borrow material for dam construction is available on site; however, rock greater than 6-inches may run 15 percent. Water-holding capabilities appear fair.

Engineering

Notes:

The recommended location for an excavated emergency spillway is at the left abutment. Drilling may be required to determine the permeability of silty gravel. Preliminary structure designs indicate that a concrete chute spillway will probably be needed to avoid excessive velocity in an excavated emergency spillway.

Public

Ownership:

About 5% of the site is owned by the Town of Princeton. The City of Worcester also owns about 5% of the site.

SITE NA-0506

Location: On a tributary to Muschopauge Brook approximately 200 feet upstream from Glenwood Road in Rutland, Massachusetts.

Wachusett Mountain, Massachusetts Quadrangle.

Latitude: $42^{\circ}24'16''$ Longitude: $71^{\circ}56'23''$

Engineering
Notes:

This site does not meet criteria for this study. At the 10 to 1 drainage area to pond area ratio the depth at the dam is less than 7 feet. Drainage area is 534 acres. No further investigations were made at the site.

SITE NA-0507

Location: On Muschopauge Brook approximately 2200 feet upstream from Wachusett Road in Rutland, Massachusetts.

Wachusett Mountain, Massachusetts Quadrangle.

Latitude: $42^{\circ}23'45''$ Longitude: $71^{\circ}55'45''$

Facilities
Affected:

Below elevation 1055
900 feet of Campbell Street
350 feet of Glenwood Road

Below elevation 1050
375 feet of Campbell Street
200 feet of Glenwood Road

Geologic
Conditions:

The left abutment is thin discontinuous englacial drift underlain by schist bedrock. Depth to schist bedrock in the foundation is not known, but may be 15 to 25 feet. There are no apparent leakage problems. Impervious borrow material for dam construction is available on site; however, rock greater than 6-inches may run 15 percent. Water-holding capabilities appear to be good.

Engineering
Notes:

The recommended location for an emergency spillway is at the right abutment.

SITE NA-0508

Location: On outlet end of Holbrook Swamp approximately 1500 feet upstream from Quinapoxet Reservoir in Rutland, Massachusetts.

Wachusett Mountain, Massachusetts Quadrangle

Latitude: 42°23'40" Longitude: 71°53'29"

Facilities

Affected: No affected facilities below elevation 860.

Geologic

Conditions: The left abutment is silty gravel on the lower terrace and silty sand glacial till higher on the abutment. The right abutment is outwash gravel on the lower half of the abutment and dense silty sand higher on the abutment. Depth to schist bedrock in the foundation is not known, but may be 20 to 25 feet. There are no apparent leakage problems, but there could be some through the silty gravel terraces. Impervious borrow material for dam construction is available on site; however, rock size greater than 6-inches may run 20 percent. Waterholding capabilities appear good.

Engineering

Notes: The recommended location for an emergency spillway is at the left abutment.

Public

Ownership: About 70% of the site is owned by the City of Worcester.

SITE NA-0509

Location: On a tributary to Quinapoxet Reservoir approximately 200 feet upstream from Whitney Road in Holden, Massachusetts.

Wachusett Mountain, Massachusetts Quadrangle.

Latitude: 42°23'03" Longitude: 71°53'20"

Facilities

Affected: Below elevation 795
550 feet of Whitney Road
800 feet of Bryant Road

Below elevation 790
100 feet of Whitney Road
200 feet of Bryant Road

SITE NA-0509 (Cont'd)

Geologic
Conditions:

Both abutments are silty gravel outwash. Depth to schist bedrock in the foundation is not known, but may be 15 to 25 feet. There are no apparent leakage problems. Impervious borrow material for dam construction is available on site, but contains cobbles and boulders. Waterholding capabilities appear good.

Engineering
Notes:

The recommended location for an emergency spillway is at the right abutment.

Public
Ownership:

About 20% of the site is owned by the City of Worcester.

SITE NA-0510

Location:

On a tributary to Maple Spring Pond approximately 300 feet upstream from Route 122A in Holden, Massachusetts.

Paxton, Massachusetts Quadrangle.

Latitude: 42°22'00" Longitude: 71°54'04"

Remarks:

This site did not meet criteria for this study due to the small contributing drainage area; (118 acres); therefore, no further investigations were made.

SITE NA-0511

Location:

On a tributary to Maple Spring Pond approximately 150 feet upstream from Princeton Street in Holden, Massachusetts.

Paxton, Massachusetts Quadrangle.

Latitude: 42°22'22" Longitude: 71°53'12"

Facilities
Affected:

No affected facilities below elevation 785.

SITE NA-0511 (Cont'd)

Geologic

Conditions:

The left abutment is silty sand glacial till. The right abutment is silty gravel outwash. Depth to schist bedrock in the foundation is not known, but may be 15 to 25 feet. There is a possible leakage problem in the right abutment. Impervious borrow material for dam construction is available on site; however, rock greater than 6 inches may run 25 percent. Waterholding capabilities appear to be fair to good.

Engineering

Notes:

Neither abutment is suitable for an excavated emergency spillway. A concrete emergency spillway will probably be necessary. Waterholding capabilities will depend on the permeability of gravel on the right abutment.

Public

Ownership:

About 10% of the site is owned by the City of Worcester.

SITE NA-0512

Location:

On a tributary to Quinapoxet River approximately 300 feet upstream from the Quabbin Aqueduct in Holden, Massachusetts.

Sterling, Massachusetts Quadrangle.

Latitude: $42^{\circ}22'54''$ Longitude: $71^{\circ}52'12''$

Remarks:

This site did not meet criteria for this study due to the small contributing drainage area, (179 acres); therefore, no further investigations were made.

SITE NA-0513

Location: On Quinapoxet River approximately 1000 feet
upstream from Mills Street in Holden,
Massachusetts.

Sterling, Massachusetts Quadrangle

Latitude: 42°22'59" Longitude: 71°51'27"

Facilities
Affected The Quabbin aqueduct becomes affected at about
elevation 640.

Geologic
Conditions: Both abutments are coarse, cobbly gravel. Depth
to schist bedrock in the foundation is not known,
but may be 5 to 10 feet. There are leakage
problems on both abutments. Impervious borrow
material for dam construction was not located
on site. Waterholding capabilities appear poor.

Engineering
Notes: The recommended location for an excavated
emergency spillway is at the right abutment.
It does not appear that an effective cutoff
can be made. Preliminary structure designs
indicate that a concrete chute emergency spill-
way may be needed to avoid excessive velocity
in an excavated emergency spillway.

Public
Ownership: About 10% of the site is owned by the Metropolitan
District Commission. The Metropolitan District
Commission also controls water rights on the river.

SITE NA-0514

Location: On Governor Brook approximately 1500 feet
upstream from Sterling Street in Holden,
Massachusetts.

Sterling, Massachusetts Quadrangle.

Latitude: 42°24'25" Longitude: 71°50'38"

Facilities
Affected: Below elevation 700
3 houses
1 shed
700 feet of power line
2500 feet of Sterling Street

SITE NA-0514 (Cont'd)

Facilities

Affected:

(cont'd)

Below elevation 695

2 houses

1 shed

2500 feet of Sterling Street

Below elevation 690

1 house

1 shed

Geologic

Conditions:

Both abutments are silty sand, glacial till containing approximately 30 percent boulders. Depth to basaltic bedrock is not known, but may be 10 to 20 feet. There are no apparent leakage problems. Impervious borrow material for dam construction is available on site; however, rock greater than 6-inches may run 30 percent. Waterholding capabilities appear to be good.

Engineering

Notes:

The recommended location for an emergency spillway is at the right abutment.

Public

Ownership:

About 5% of the site is owned by the Town of Sterling. The Town of Holden also owns about 5% of the site.

SITE NA-0515

Location:

On Trout Brook approximately 4900 feet upstream from Manning Street in Holden, Massachusetts.

Sterling, Massachusetts Quadrangle.

Latitude: 42°23'41"

Longitude: 71°50'51"

Facilities

Affected:

Below elevation 660

1 house

1 shed

500 feet of Woods Street

6700 feet of Mason Street

3600 feet of Sterling Road

SITE NA-0515 (Cont'd)

Geologic
Conditions:

Both abutments are outwash sand and gravel. Depth to schist bedrock is not known, but may be deep. There are leakage problems in both abutments and possibly in the foundation. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear poor.

Engineering
Notes:

The recommended location for an excavated emergency spillway is at the left abutment. There seems little chance that an effective cutoff can be made. Preliminary structure designs indicate that a concrete emergency spillway (chute or monolithic conduit) may be needed to avoid excessive velocity in an excavated emergency spillway.

Public
Ownership:

About 50% of the site is owned by the Town of Holden.

SITE NA-0516

Location:

On a tributary to Trout Brook approximately 5500 feet upstream from Manning Street in Holden, Massachusetts.

Sterling, Massachusetts Quadrangle.

Latitude: $42^{\circ}23'54''$ Longitude: $71^{\circ}50'14''$

Engineering
Notes:

This site did not meet criteria for this study due to the small contributing drainage area (242 acres); therefore, no further investigations made.

SITE NA-0517

Location: On Trout Brook approximately 1600 feet upstream from Manning Street in Holden, Massachusetts.

Sterling, Massachusetts Quadrangle.

Latitude: 42°23'16" Longitude: 71°50'22"

Facilities

Affected:	<u>Below elevation 660</u>	<u>Below elevation 640</u>
	3 houses	1 house
	2 sheds	500 feet of Woods Street
	500 feet of Woods Street	6700 feet of Mason Street
	6700 feet of Mason Street	3600 feet of Sterling Road
	3600 feet of Sterling Road	2400 feet of Moscow Street
	2400 feet of Moscow Street	900 feet of North Street
	900 feet of North Street	

Geologic

Conditions: The left abutment is outwash sand or gravel. The right abutment is glacial drift with many cobbles and boulders. Depth to schist bedrock in the foundation is not known, but may be 15 to 25 feet. There are leakage problems in the left abutment and the foundation. Impervious borrow material for dam construction is available on site, but contains cobbles and boulders. Waterholding capabilities appear good.

Engineering

Notes: The recommended location for an excavated emergency spillway is at the right abutment. Waterholding capabilities appear to be good if a cutoff can be made in the foundation and the left abutment. Preliminary structure designs indicate that a concrete chute spillway may be needed at lower levels of development to avoid excessive velocity in an excavated emergency spillway.

Public

Ownership: The Town of Holden owns the entire site.

SITE NA-0518

Location: On a tributary to Thomas Basin approximately
2300 feet upstream from Laurel Street in
West Boylston, Massachusetts.

Sterling, Massachusetts Quadrangle.

Latitude: 42°23'50" Longitude: 71°48'41"

Facilities
Affected: No affected facilities below elevation 605.

Geologic
Conditions: Both abutments are englacial drift with possibly
outwash sand and gravel on the left terrace in
the foundation. Depth to bedrock in the founda-
tion is not known, but may be shallow. There is
a possible leakage problem in the foundation.
Impervious borrow material for dam construction
is available on site. Waterholding capabilities
appear good if the foundation is not sand and gravel.

Engineering
Notes: The recommended location for an emergency spillway
is at the left abutment.

SITE NA-0519

Location: On Worcester Brook approximately 3000 feet
upstream from Causeway Street in Holden,
Massachusetts.

Paxton, Massachusetts Quadrangle.

Latitude: 42°21'45" Longitude: 71°55'21"

Facilities
Affected: Gas station and equipment building at elevation 990.

Geologic
Conditions: Both abutments are silty sand glacial till. Depth
to schist bedrock in the foundation is not known,
but may be 40 to 50 feet. There is a possibility
of leakage in the foundation. Impervious borrow
material for dam construction is available on site.
Waterholding capabilities appear to be fair.

Engineering
Notes: The recommended location for an emergency spillway
is at the right abutment.

NA-0520 -- PINE HILL RESERVOIR

Location: Near the Rutland-Holden-Paxton town line intersection in Holden, Massachusetts.

Paxton, Massachusetts Quadrangle.

<u>Surface Area</u> <u>(Acres)</u>	<u>Height of</u> <u>Dam (Ft.)</u>	<u>Drainage</u> <u>(Acres)</u>	<u>Area</u> <u>(Sq. Mi.)</u>
331	100	4130	6.46

Potential
for
Expansion:

Site appears to be fully developed.

Remarks:

This is a Worcester Water Supply reservoir. Structure is an earth dam with a large concrete section in the center with an ogee spillway.



SITE NA-0521

Location: On a tributary to Eagle Lake approximately 600 feet upstream from Kendall Road in Holden, Massachusetts.

Paxton, Massachusetts Quadrangle.

Latitude: 42°20'58" Longitude: 71°52'59"

Remarks: This site did not meet criteria for this study due to size of contributing drainage area (231 acres); therefore, no further investigations were made.

SITE NA-0522

Location: On a tributary to Chaffin Pond approximately 700 feet upstream from Salisbury Street in Holden, Massachusetts.

Worcester North, Massachusetts Quadrangle.

Latitude: 42°19'03" Longitude: 71°51'04"

Remarks: This site did not meet criteria for this study due to the small contributing drainage area (261 acres); therefore, no further investigations were made.

SITE NA-0523

Location: On a tributary to Chaffin Pond approximately 700 feet upstream from Newell Street in Holden, Massachusetts.

Worcester North, Massachusetts Quadrangle.

Latitude: 42°19'28" Longitude: 71°50'41"

SITE NA-0523 (Cont'd)

Facilities

Affected:

Below elevation 795

14 houses
900 feet of Salisbury Street

Below elevation 785

9 houses
800 feet of Salisbury Street

Below elevation 770

4 houses
500 feet of Salisbury Street

Geologic

Conditions:

The left abutment is outwash sand and gravel. The right abutment is silty sand, dense glacial till. Depth to schist bedrock in the foundation is not known, but may be 20 to 25 feet. There are leakage problems in the left abutment and the foundation. Impervious borrow material was not located on site. Waterholding capabilities appear fair to poor depending on cutoff.

Engineering

Notes:

The recommended location for an emergency spillway is at the left abutment.

SITE NA-0524

Location:

On Warren Tannery Brook approximately 500 feet upstream from Quinapoxet Street in Holden, Massachusetts.

Worcester North, Massachusetts Quadrangle.

Latitude: 42°21'52" Longitude: 71°52'15"

Engineering

Notes:

Drainage Area = 696 acres
This site was eliminated from further study due to low storage potential and high damages to facilities.

Housing developments along right bank, Grove Cemetery, and Boston and Maine Railroad along left bank are affected.

SITE NA-0525

Location: On Quinapoxet River approximately 1300 feet
upstream from Wachusett River Street in
Holden, Massachusetts.

Worcester North, Massachusetts Quadrangle.

Latitude: 42°22'13" Longitude: 71°49'52"

Facilities
Affected:

Below elevation 580
12 houses
1 garage
300 feet of Bullard Street
800 feet of Wachusett Street

Below elevation 575
1 house
700 feet of Wachusett Street

Geologic
Conditions:

Both abutments are outwash sand and gravel.
Depth to schist bedrock in the foundation is not
known, but may be 20 to 25 feet. There are
leakage problems in both abutments. Impervious
borrow material for dam construction is available
on site. Waterholding capabilities appear poor.

Engineering
Notes:

The recommended location for an excavated emergency
spillway is at the right abutment. Preliminary
structure designs indicate that a concrete drop
structure will be needed as the emergency
spillway.

Public
Ownership:

About 10% of the site is owned by the Metropolitan
District Commission.

SITE NA-0526

Location: On Poor Farm approximately 200 feet upstream
from Newell Street in Holden, Massachusetts.

Worcester North, Massachusetts Quadrangle.

Latitude: 42°19'12" Longitude: 71°50'14"

Facilities
Affected: No facilities affected below elevation 740.

Geologic
Conditions: Left abutment is outwash sand and gravel.
Right abutment is silty sand, dense glacial
till. Depth to schist bedrock in foundation
is not known, but may be 20 to 25 feet. There
are leakage problems in the foundation and left
abutment. Waterholding capabilities appear fair.

Engineering
Notes: Recommended location for an earth emergency
spillway is at the left abutment.

SITE NA-0527

Location: On a tributary to South Wachusett River approxi-
mately 500 feet upstream from Hubbardston Road
in Princeton, Massachusetts.

Wachusett Mountain, Massachusetts Quadrangle.

Latitude: 42°26'45" Longitude: 71°54'30"

Facilities
Affected: No affected facilities below elevation 990.

Geologic
Conditions: Both abutments are silty sand glacial till.
Depth to schist bedrock in the foundation is
not known, but may be 15 to 25 feet. There
are no apparent leakage problems. Impervious
borrow material for dam construction is available
on site; however, rock greater than 6-inches may
run 40 percent. Waterholding capabilities appear
good.

Engineering
Notes: The recommended location for an emergency spillway
is at the right abutment.

Public
Ownership: About 90% of the site is owned by the Massachusetts
Audubon Society.

NA-0528 -- QUINAPOXET RESERVOIR

Location: On the Quinapoxet River about 500 feet upstream of Princeton Street in Holden, Massachusetts.

Wachusett Mountain, Massachusetts Quadrangle

<u>Surface Area</u> <u>(Acres)</u>	<u>Height of</u> <u>Dam (Ft.)</u>	<u>Drainage</u> <u>(Acres)</u>	<u>Area</u> <u>(Sq. Mi.)</u>
256	40	12570	19.63

Potential for Expansion: Limited by the Boston and Maine Railroad on right edge of reservoir.

Remarks: This reservoir is owned by the Bureau of Water, City of Worcester. Structure is an earth dam with a side channel inlet chute spillway on the right abutment. Inlet weir is about 200 feet long. Outlet channel is about 30 feet wide and 8 feet deep. Upstream slope of the dam is rock rip-rapped. Dam and spillway are in very good condition.



NA-0529 -- ASNEBUMSKIT POND

Location: Downstream of Holden Road (Route 31) in
Paxton, Massachusetts.

Paxton, Massachusetts Quadrangle

<u>Surface Area</u> <u>(Acres)</u>	<u>Height of Dam</u> <u>(Ft.)</u>	<u>Drainage Area</u>	
		<u>(Acres)</u>	<u>(Sq. Mi.)</u>
44	15	287	0.45

Potential
for
Expansion:

Further development would be limited by
the small drainage area.

Remarks:

This is an earth fill dam. The upstream
slope is rock rip-rapped. There is an
18-inch concrete pipe spillway with a
gate, as well as a 20-foot wide concrete
weir. It appears that water could flow
around the right side causing undermining
of the weir. Structure is owned by the
Paxton Water Commission.

NA-0530 -- STREETER POND

Location: At Pond Street in Paxton, Massachusetts.
Paxton, Massachusetts Quadrangle

<u>Surface Area</u> <u>(Acres)</u>	<u>Height of Dam</u> <u>(Ft.)</u>	<u>Drainage Area</u> <u>(Acres)</u>	<u>(Sq. Mi.)</u>
18	8	450	0.71

Potential
for
Expansion: Further development is limited by the
small drainage area.

Remarks: This is an old mill dam in poor condition.
Downstream face of the dam is vertical
stone masonry. There are large trees
growing on the fill. The stone spillway
at the right abutment is in very poor
condition.

NA-0531 -- KENDALL RESERVOIR

Location: Near Kendall Street in Holden, Massachusetts.

Paxton, Massachusetts Quadrangle.

<u>Surface Area</u> <u>(Acres)</u>	<u>Height of</u> <u>Dam (Ft.)</u>	<u>Drainage</u> <u>(Acres)</u>	<u>Area</u> <u>(Sq. Mi.)</u>
166	25	1110	1.74

Potential
for

Expansion:

Small drainage area may limit further
expansion.

Remarks:

This is a Worcester water supply reservoir. Structure is an earth dam with rip-rapped upstream slope. Spillway is a 30 foot wide concrete chute. Some concrete spalling was noted on the sidewalls. Earth-fill section is well-maintained. This reservoir receives water diverted from Asnebumskit Brook.



NA-0532 -- STUMP POND

Location: Upstream of Causeway Street in Holden,
Massachusetts.

Paxton, Massachusetts Quadrangle

<u>Surface Area</u> <u>(Acres)</u>	<u>Height of Dam</u> <u>(Ft.)</u>	<u>Drainage Area</u> <u>(Acres)</u>	<u>(Sq. Mi.)</u>
28	4	180	0.28

Potential
for

Expansion: Expansion would be limited by Causeway Street
as well as Route 122A and a school.

Remarks: Causeway Street forms the dam. The spillway
is a 36-inch culvert with a drop inlet.

NA-0533 -- EAGLE LAKE

Location: Near High Street in Holden, Massachusetts.

Paxton, Massachusetts Quadrangle

<u>Surface Area</u> <u>(Acres)</u>	<u>Height of</u> <u>Dam (Ft.)</u>	<u>Drainage</u> <u>(Acres)</u>	<u>Area</u> <u>(Sq. Mi.)</u>
54	15	6550	10.23

Potential
for
Expansion:

Further expansion might be possible about 500 feet upstream at the site of an old breached dam.

Remarks:

This is a mill dam with concrete ogee spillway consisting of 3 bays about 25 feet wide.



NA-0534 -- UNIONVILLE POND

Location: Upstream of the intersection of Bullard Street and Wachusett Street in Holden, Massachusetts.

Worcester, Massachusetts Quadrangle

<u>Surface Area</u> <u>(Acres)</u>	<u>Height of Dam</u> <u>(Ft.)</u>	<u>Drainage Area</u>	
		<u>(Acres)</u>	<u>(Sq. Mi.)</u>
22	20	1460	2.28

Potential
for
Expansion:

Expansion of this site appears feasible.
Road and spillway would need to be rebuilt.
Very few facilities affected by expansion.

Remarks:

Wachusett Street forms the dam for this site.
The spillway consists of 2 36-inch diameter
metal pipes. Structure is in fair condition.
Concrete headwall is cracked.

NA-0535 -- MAPLE SPRING POND (PETER CARR POND)

Location: Near Princeton Street in Holden, Massachusetts
Wachusett Mountain Quadrangle

<u>Surface Area</u> <u>(Acres)</u>	<u>Height of Dam</u> <u>(Ft.)</u>	<u>Drainage Area</u>	
		<u>(Acres)</u>	<u>(Sq. Mi.)</u>
41	6	970	1.52

Potential
for
Expansion: Limited by Boston and Maine Railroad along
east bank and Princeton Street.

Remarks: Princeton Street forms the dam. The
spillway is a 4 foot wide drop structure
about 15 feet upstream from a stone box
culvert under Princeton Street. Overall
condition is fair.

NA-0536 -- MUSCHOPAUGE POND

Location: Near Rice Hill in Rutland, Massachusetts
Wachusett Mountain, Massachusetts Quadrangle

<u>Surface Area</u> <u>(Acres)</u>	<u>Height of Dam</u> <u>(Ft.)</u>	<u>Drainage Area</u>	
		<u>(Acres)</u>	<u>(Sq. Mi.)</u>
68	6	380	0.60

Potential
for

Expansion: Limited by the small drainage area.

Remarks: This is a low earth-fill dam in poor condition. The upstream slope is rock rip-rapped. There is a stonelined spillway on the right abutment. The principal spillway is a 10-foot wide, 2 foot deep concrete weir. Trees are growing on the dam.

NA-0537 -- DAWSON POND

Location: Near Salisbury Street in Holden, Massachusetts.
Worcester North, Massachusetts Quadrangle.

<u>Surface Area</u> (Acres)	<u>Drainage</u> (Acres)	<u>Area</u> (Sq. Mi.)
19	590	0.92

Remarks: Dawson Pond has no dam. No photos were taken.

NA-0538 -- CHAFFIN POND

Location: About 1500 feet upstream of Salisbury Street
in Holden, Massachusetts.
Worcester North, Massachusetts Quadrangle

<u>Surface Area</u> (Acres)	<u>Drainage</u> (Acres)	<u>Area</u> (Sq. Mi.)
112	2510	3.93

Remarks: Chaffin Pond has no dam. No photos were taken.

SUMMARY DATA FOR POTENTIAL UPSTREAM RESERVOIR SITES

STUDY AREA-NASHUA RIVER										SUBWATERSHED-QUINAPOXET RIVER									
BENEFICIAL POOL																			
										</									

STUDY AREA-NASHUA RIVER

SUBWATERSHED-QUINAPOXET RIVER

BENEFICIAL POOL																												EMERGENCY SPILLWAY										DESIGN HIGH WATER										SAFE YIELD																																																															
COST														COST														COST														COST																																																																					
ELEV	STORAGE	PER AC FT	AREA	SURF AC	DEPTH AT DAM	CREST ELEV	STORAGE AT CREST	COST PER AC FT	TOP ELEV	FILL VOL	DAM AC FT	IN	AC FT	IN	AC FT	PER	AREA	ELEV	AREA	HGT	PERCENT CHANCE	DAM	DESIGN	AREA	ELEV	AREA	HGT	FILL VOL	PERCENT CHANCE	AT 95	SAFE YIELD																																																																																
(MSL)	AC FT	IN	(AC)	(AC)	(FT)	(MSL)	AC FT	IN	(AC)	(MSL)	AC FT	IN	(AC)	(MSL)	AC FT	IN	(AC)	(MSL)	AC FT	IN	(AC)	(MSL)	AC FT	IN	(AC)	(MSL)	AC FT	IN	(AC)	(MSL)	AC FT	IN																																																																															
DA= 2.00 SQ MI = 1280 AC																												USGS QUAD- WACHUSETT MTN MASS																												LATITUDE 42-25-13 LONGITUDE 71-53-20																												345 CFS																											
SITE RATING (2)																												100-YR PRIN SPWY DESIGN STORM RUNOFF = 8.00 IN, PEAK FLOW =																												345 CFS																												345 CFS																											
792.2	0	0.0	6	2.2	809.4	E	443	4.1	1810	811.8	37	813.9	24	26	0.28																																																																																																
798.5	100	0.8	32890	8.6	809.0	E	435	4.1	1920	811.5	37	813.3	23	24	0.83																																																																																																
814.0	613	5.8	1770	41	26740	E	914	8.6	1190	822.9	53	824.6	35	65	1.26																																																																																																
829.3	1383	13.0	970	60	22340	E	1560	14.6	860	834.1	66	835.8	46	132	1.61																																																																																																
843.9	2410	22.6	720	80	21550	E	2627	24.6	660	848.8	88	850.5	61	292	1.61																																																																																																
847.0	2667	25.0	680	85	21320	E	2899	27.2	630	852.0	92	853.8	64	338	1.66																																																																																																
DA= 10.40 SQ MI = 6656 AC																												USGS QUAD- WACHUSETT MTN MASS																												LATITUDE 42-24-40 LONGITUDE 71-53-27																												1382 CFS																											
SITE RATING (2)																												100-YR PRIN SPWY DESIGN STORM RUNOFF = 8.00 IN, PEAK FLOW =																												1382 CFS																												1382 CFS																											
751.5	100	0.2	13850	36	38170	E	183	0.3	7560	766.2	94	769.4	27	15	0.46																																																																																																
759.3	489	0.8	3460	66	25520	E	572	1.0	2950	773.5	126	777.0	35	30	1.39																																																																																																
766.4	1071	1.9	1550	95	17550	E	1154	2.0	1440	775.2	134	778.0	36	33	2.32																																																																																																
771.9	1654	3.0	1140	118	15990	E	1737	3.0	1090	777.5	144	779.8	38	38	2.97																																																																																																
772.5	1734	3.0	1080	121	15530	E	1817	3.3	1030	777.4	144	779.5	38	37	3.05																																																																																																
DA= 1.60 SQ MI = 1024 AC																												USGS QUAD- WACHUSETT MTN MASS																												LATITUDE 42-23-45 LONGITUDE 71-55-45																												276 CFS																											
SITE RATING (1)																												100-YR PRIN SPWY DESIGN STORM RUNOFF = 8.00 IN, PEAK FLOW =																												276 CFS																												276 CFS																											
1020.4	0	0.0	5	6.4	1034.9	E	354	4.1	1080	1037.4	54	1040.1	26	29	0.26																																																																																																
1027.6	100	1.2	4180	23	18450	E	321	3.8	1300	1036.6	51	1038.5	24	25	0.50																																																																																																
1034.1	303	3.5	1540	42	11040	E	431	5.1	1080	1039.0	59	1040.5	27	30	0.83																																																																																																
1041.1	710	8.3	900	80	8030	E	964	11.3	660	1046.1	150	1048.8	35	59	1.18																																																																																																
1047.6	1523	17.9	550	172	4900	E	2003	23.5	420	1051.1	216	1054.6	41	90	1.33																																																																																																
1050.9	2133	25.0	430	212	4350	E	2704	31.7	340	1053.9	240	1057.1	43	106	1.33																																																																																																

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SUMMARY DATA FOR POTENTIAL UPSTREAM RESERVOIR SITES

STUDY AREA-NASHUA RIVER

SUBWATERSHED-QUINAPOXET RIVER

BENEFICIAL POOL

*

EMERGENCY SPILLWAY

DESIGN * HIGH WATER *

DAM

SAFE

YIELD

ELEV STORAGE COST PER AC FT IN (\$)

AC FT (\$)

AREA (\$)

COST/ SURF AC

DEPTH AT DAM

CREST ELEV

STORAGE AT CREST

COST PER AC FT

TOP ELEV

HGT VOL (1000)

FILL PERCENT

CHANCE

(MSL) AC FT IN (\$)

AC FT (\$)

AREA (\$)

COST/ SURF AC

DEPTH AT DAM

CREST ELEV

STORAGE AT CREST

COST PER AC FT

TOP ELEV

HGT VOL (1000)

FILL PERCENT

CHANCE

NA-0508

DA= 3.90 SQ MI = 2496 AC

USGS QUAD- WACHUSETT MTN MASS

LATITUDE 42-23-40 LONGITUDE 71-53-29

STREAM WATER QUALITY (A) 100-YR PRIN SPWY DESIGN STORM RUNOFF = 8.00 IN, PEAK FLOW = 672 CFS

802.0 0 0.0 19 5230 47 11140 5.1 813.9 E 863 4.1 530 816.3 120 819.2 19 22 0.34

805.0 100 0.5 47 5230 47 11140 5.1 813.9 E 863 4.1 530 816.3 120 819.2 19 22 0.34

816.4 1120 5.4 660 121 6080 16.4 822.9 E 2031 9.8 360 825.4 158 828.6 29 60 1.57

827.0 2650 12.7 370 165 6000 27.0 831.5 E 3464 16.7 290 834.0 188 837.3 37 126 2.46

838.1 4690 22.5 280 200 6560 38.2 840.6 E 5237 25.2 250 843.1 222 845.8 46 243 3.14

840.6 5200 25.0 280 209 6850 40.7 843.1 E 5783 27.7 250 845.6 235 848.3 48 288 3.24

NA-0509

DA= 2.00 SQ MI = 1280 AC

USGS QUAD- WACHUSETT MTN MASS

LATITUDE 42-23-03 LONGITUDE 71-53-20

STREAM WATER QUALITY (A) 100-YR PRIN SPWY DESIGN STORM RUNOFF = 8.00 IN, PEAK FLOW = 345 CFS

738.2 0 0.0 5 4040 23 17580 13.7 755.2 E 443 4.1 800 757.5 47 760.2 28 36 0.28

745.7 100 0.8 4040 23 17580 13.7 755.2 E 443 4.1 800 757.5 47 760.2 28 36 0.28

759.3 613 5.8 960 49 11900 27.2 765.8 E 1004 9.3 590 768.2 72 770.7 39 86 0.83

771.0 1383 13.0 570 82 9640 39.0 773.5 E 1613 15.1 490 776.0 103 778.0 46 144 1.26

781.0 2410 22.6 470 126 9080 49.0 783.5 E 2766 25.9 410 785.9 153 788.5 57 270 1.61

782.9 2667 25.0 460 136 8950 50.9 785.4 E 3022 28.2 400 787.8 164 790.5 59 301 1.66

NA-0511

DA= 1.30 SQ MI = 832 AC

USGS QUAD- PAXTON MASS

LATITUDE 42-22-22 LONGITUDE 71-53-12

STREAM WATER QUALITY (A) 100-YR PRIN SPWY DESIGN STORM RUNOFF = 8.00 IN, PEAK FLOW = 388 CFS

755.5 0 0.0 6 3250 27 12040 10.0 766.5 E 288 4.1 1050 769.0 64 772.0 20 34 0.24

762.0 100 1.4 3250 27 12040 10.0 766.5 E 288 4.1 1050 769.0 64 772.0 20 34 0.24

769.2 427 6.1 1180 65 7770 17.2 771.7 E 613 8.8 820 774.2 79 776.8 25 54 0.56

775.8 917 13.2 770 83 8460 23.7 778.3 E 1143 16.5 620 780.7 95 783.5 32 91 0.84

781.2 1407 20.2 620 96 9040 29.2 783.7 E 1662 24.0 520 786.2 107 789.8 38 139 1.00

782.5 1533 22.1 570 99 8830 30.5 785.0 E 1795 25.9 490 787.0 109 789.8 38 140 1.04

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SUMMARY DATA FOR POTENTIAL UPSTREAM RESERVOIR SITES

STUDY AREA-NASHUA RIVER

SUBWATERSHED-QUINAPOXET RIVER

BENEFICIAL POOL

EMERGENCY SPILLWAY

DESIGN

DAM

SAFE

YIELD

COST

STORAGE

PER

AC

FT

IN

ELEV

STORAGE

PER

AC

FT

IN

(MSL)

AC

FT

IN

(MSL)

(CY)

DA= 21.60 SQ MI = 13824 AC

USGS QUAD- STERLING MASS

RUNOFF = 8.00 IN, PEAK FLOW = 3832 CFS

LATITUDE 42-22-59

LONGITUDE 71-51-27

SITE RATING (3)

100-YR PRIN SPWY DESIGN STORM

AC

FT

IN

(MSL)

(CY)

621.0

100

0.1

10270

30

33700

21.0

E

623.5

354

0.3

2900

626.0

40

629.5

29

18

0.62

636.4

797

0.7

2450

61

31870

36.4

T

636.4

970

0.8

2010

650.9

96

656.3

56

109

2.42

650.0

1842

1.6

1260

94

24730

50.0

T

650.0

2015

1.7

1150

664.2

139

669.8

70

211

4.24

659.8

2888

2.5

860

119

20830

59.8

T

659.8

3060

2.7

810

665.9

146

669.8

70

211

5.57

NA-0514

DA= 2.60 SQ MI = 1664 AC

USGS QUAD- STERLING MASS

RUNOFF = 8.00 IN, PEAK FLOW = 775 CFS

LATITUDE 42-24-25

LONGITUDE 71-50-38

SITE RATING (1)

100-YR PRIN SPWY DESIGN STORM

AC

FT

IN

(MSL)

(CY)

665.0

0

0.0

12

3.0

678.3

575

4.1

970

680.7

91

683.4

21

50

0.30

669.9

100

0.7

6180

31

20170

7.8

E

678.4

581

4.1

1060

680.8

92

683.0

21

49

0.30

675.9

389

2.8

1840

64

11220

13.8

E

680.4

751

5.4

950

682.9

106

685.0

23

58

0.72

682.8

968

7.0

940

106

8600

20.7

E

685.3

1274

9.2

710

687.8

139

690.0

28

93

1.22

689.5

1836

13.2

710

152

8550

27.5

E

692.0

2309

16.6

560

694.5

268

698.0

36

189

1.67

692.5

2376

17.1

610

217

6670

30.5

E

695.0

3015

21.7

480

696.5

320

699.8

38

218

1.88

NA-0515

DA= 5.57 SQ MI = 3565 AC

USGS QUAD- STERLING MASS

RUNOFF = 8.00 IN, PEAK FLOW = 1218 CFS

LATITUDE 42-23-41

LONGITUDE 71-50-51

SITE RATING (3)

100-YR PRIN SPWY DESIGN STORM

AC

FT

IN

(MSL)

(CY)

627.2

0

0.0

12

7.1

653.9

1719

5.8

1390

656.2

146

659.8

40

75

0.37

632.8

100

0.3

24480

27

91550

12.8

T

632.8

145

0.5

16940

647.7

97

651.9

32

38

0.37

640.9

445

1.5

5840

59

44400

20.9

T

640.9

489

1.6

5310

653.9

132

658.5

39

68

1.05

647.7

962

3.2

2800

96

28010

27.7

T

647.7

1006

3.4

2680

656.5

147

659.8

40

74

1.67

652.5

1498

5.0

1820

124

22040

32.5

T

652.5

1542

5.1

1770

657.8

155

659.9

40

76

2.16

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SUMMARY DATA FOR POTENTIAL UPSTREAM RESERVOIR SITES

STUDY AREA-NASHUA RIVER										SUBWATERSHED-QUINAPOXET RIVER									
BENEFICIAL POOL																			

SUMMARY DATA FOR POTENTIAL UPSTREAM RESERVOIR SITES

STUDY AREA-NASHUA RIVER										SUBWATERSHED-QUINAPOXET RIVER																			
BENEFICIAL POOL					EMERGENCY SPILLWAY					DESIGN					DAM														
ELEV	STORAGE	COST PER AC FT	AREA	COST/ SURF AC	DEPTH AT DAM	CREST ELEV	STORAGE AT CREST	COST PER AC FT																					
(MSL)	AC FT	IN	(\$)	(AC)	(\$)	(FT)	(MSL)	AC FT	IN	(\$)	(MSL)	(AC)	(MSL)	FT	CY	FILL VOL	HGT	ELEV	TOP										
DA= 0.90 SQ MI = 576 AC										USGS QUAD- WORCESTER NORTH MASS										LATITUDE 42-19-28 LONGITUDE 71-50-41									
STREAM WATER QUALITY (A)										100-YR PRIN SPY DESIGN STORM										RUNOFF = 8.00 IN, PEAK FLOW = 268 CFS									
SITE RATING (3)										100-YR PRIN SPY DESIGN STORM										RUNOFF = 8.00 IN, PEAK FLOW = 268 CFS									
755.0	0	0.0	3	5.0	5.0	769.0	E	199	4.1	4140	771.5	36	774.7	25	24														
765.7	100	2.0	8360	22	37640	15.7	E	172	3.5	4860	770.7	35	772.4	22	19														
772.7	320	6.6	2950	37	25620	22.7	E	421	8.8	2240	777.7	41	780.0	30	39														
780.9	650	13.5	1820	45	26310	30.9	E	778	16.2	1520	785.8	60	788.4	38	71														
788.7	1090	22.7	1290	68	20490	38.7	E	1277	26.5	1100	793.5	78	797.5	48	120														
790.2	1200	25.0	1200	73	19690	40.2	E	1397	29.0	1030	795.0	80	798.9	49	129														
NA-0525										USGS QUAD- WORCESTER NORTH MASS										LATITUDE 42-22-13 LONGITUDE 71-49-52									
SITE RATING (3)										100-YR PRIN SPY DESIGN STORM										RUNOFF = 8.00 IN, PEAK FLOW = 7823 CFS									
STREAM WATER QUALITY (A)										100-YR PRIN SPY DESIGN STORM										RUNOFF = 8.00 IN, PEAK FLOW = 7823 CFS									
563.0	100	0.0	16420	76	21510	17.1	E	453	0.2	3630	572.9	170	578.7	33	56														
565.0	259	0.1	6530	94	17910	19.0	E	611	0.3	2760	573.7	178	579.0	33	58														
567.9	576	0.2	3190	122	15060	21.9	E	929	0.4	1980	574.7	187	579.4	33	59														
570.3	893	0.4	2360	145	14540	24.2	E	1246	0.5	1690	575.8	198	580.0	34	62														
NA-0526										USGS QUAD- WORCESTER NORTH MASS										LATITUDE 42-19-12 LONGITUDE 71-50-14									
SITE RATING (3)										100-YR PRIN SPY DESIGN STORM										RUNOFF = 8.00 IN, PEAK FLOW = 268 CFS									
STREAM WATER QUALITY (A)										100-YR PRIN SPY DESIGN STORM										RUNOFF = 8.00 IN, PEAK FLOW = 268 CFS									
709.2	0	0.0	7	1.2	718.5	E	199	4.1	8020	721.0	36	723.8	16	6															
715.3	100	2.0	16180	24	68500	7.3	E	174	3.5	9300	720.2	34	721.8	14	4														
722.4	320	6.6	5460	37	46650	14.3	E	425	8.8	4110	727.2	45	729.3	21	21														
730.0	650	13.5	3040	49	40460	22.0	E	790	16.5	2500	734.9	60	737.2	29	68														
737.7	1090	22.7	2060	66	33810	29.7	E	1269	26.4	1770	742.4	76	745.4	37	156														
739.3	1200	25.0	1940	70	33220	31.2	E	1390	29.0	1670	744.0	80	747.9	40	190														

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SUMMARY DATA FOR POTENTIAL UPSTREAM RESERVOIR SITES

STUDY AREA-NASHUA RIVER										SUBWATERSHED-QUINAPOXET RIVER									
BENEFICIAL POOL																			
										</									

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Notes

NASHUA STUDY AREA
SITE DATA FOR

Subwatershed NA-6, Stillwater River

The Stillwater River subwatershed covers about 48,400 acres in Berlin, Bolton, Boylston, Clinton, Holden, Lancaster, Leominster, Princeton, Sterling, West Boylston, Westminster and Worcester; all in Worcester County.

The main stream in the subwatershed is the Stillwater River which originates in the Leominster State Forest and flows southeasterly through Princeton, Sterling and West Boylston to Wachusett Reservoir. Elevations range from a high of about 2000 on Wachusett Mountain to about 370 downstream of Wachusett Reservoir. Geology within the Stillwater River Subwatershed is predominantly basalt or schist bedrock overlain by 10 to 25 feet of glacial till or englacial drift, with some outwash sand and gravel.

Thirty-one potential reservoir sites and four existing reservoirs were studied. Preliminary design summaries are included for 25 potential sites that met study criteria.

SITE NA-0601

Location: On a tributary to Paradise Pond approximately 3100 feet upstream from Route 31 in Westminster, Massachusetts.

Fitchburg, Massachusetts Quadrangle.

Latitude: 42°31'00" Longitude: 71°51'58"

Engineering

Notes: This site did not meet criteria for this study due to the small contributing drainage area (197 acres); therefore, no further investigations were made.

SITE NA-0602

Location: On a tributary to East Wachusett Brook approximately 100 feet upstream from Myrick Road in Princeton, Massachusetts.

Sterling, Massachusetts Quadrangle

Latitude: $42^{\circ}28'22''$ Longitude: $71^{\circ}52'27''$

Facilities

Affected: Below Elevation 970
400 feet of underground telephone cable.

Geologic

Condition: The left abutment is silty sand glacial till at high elevations with a gravel terrace at low elevations. The right abutment is silty sand glacial till with a gravel terrace at low elevations. Both abutments are probably shallow to bedrock. Depth to basalt bedrock in the foundation is not known, but may be 15 to 25 feet. There are leakage problems low on both abutments. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear to be fair to good provided cutoff is made beneath gravel terrace on both abutments to either glacial till or bedrock.

Engineering

Notes: The recommended location for an emergency spillway is at the right abutment.

SITE NA-0603

Location: On a tributary to East Wachusett Brook approximately 3100 feet upstream from East Princeton Road in Princeton, Massachusetts.

Sterling, Massachusetts Quadrangle

Latitude: $42^{\circ}28'13''$ Longitude: $71^{\circ}52'15''$

Facilities

Affected:	<u>Below Elevation 965</u>	<u>Below Elevation 955</u>
	5 houses	2 houses
	4 sheds	3 sheds
	1650 feet of Myrick Road	960 feet of Myrick Road
	600 feet of East Beaman Road	500 feet of East Beaman Road

SITE NA-0603 (Cont'd)

Geologic
Conditions:

Both abutments are silty sand glacial till or poorly graded sand and gravel englacial drift, very shallow to bedrock. There are numerous outcroppings of basaltic bedrock at the higher elevations. Depth to basalt bedrock in the foundation is not known, but may be 5 to 15 feet. There are no apparent leakage problems. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear good.

Engineering
Notes:

The recommended location for an emergency spillway is at the left abutment.

SITE NA-0604

Location:

On Babcock Brook approximately 2900 feet downstream from Sterling Road in Princeton, Massachusetts.

Sterling, Massachusetts Quadrangle.

Latitude: 42°26'43" Longitude: 71°51'58"

Facilities
Affected:

No facilities affected below elevation 935.

Geologic
Conditions:

The left abutment is granitic bedrock at high elevations and poorly graded sand and gravel englacial drift -- estimated 30 percent boulders. The right abutment is englacial drift along the stream and silty sand and glacial till at high elevations -- probably very shallow to bedrock. Depth to basaltic bedrock in the foundation is not known, but may be shallow. There are no apparent leakage problems. Impervious borrow material for dam construction is available on site; however, rock greater than 6-inches may run 40 percent. Waterholding capabilities appear good.

Engineering
Notes:

The recommended location for an emergency spillway is at the right abutment.

SITE NA-0605

Location: On Babcock Brook approximately 400 feet
upstream from Route 62 in Princeton,
Massachusetts.

Sterling, Massachusetts Quadrangle.

Latitude: 42°26'35" Longitude: 71°50'52"

Facilities
Affected: No facilities affected below elevation 705.

Geologic
Conditions: Both abutments are glacial till, shallow to
bedrock. There are swamp deposits at the toe
of both abutments. Depth to bedrock is not
known, but may be 20 feet. There are leakage
problems in the foundation. Waterholding
capabilities appear good.

SITE NA-0606

Location: On Babcock Brook approximately 1000 feet
southeast of West Sterling Cemetery in
Princeton, Massachusetts.

Sterling, Massachusetts Quadrangle.

Latitude: 42°26'38" Longitude: 71°50'03"

Facilities
Affected: Below elevation 660
1650 feet of Bullard Road

Below elevation 655
1185 feet of Bullard Road

Below elevation 650
720 feet of Bullard Road

Geologic
Conditions: Both abutments are silty sand glacial till
probably shall to bedrock, with 50 percent boulders
and cobbles. There are swamp deposits at toe of
both abutments. Depth to basalt bedrock in the
foundation is not known, but may be 10 to 20 feet.
There are leakage problems in the foundation.
Impervious borrow material for dam construction is
available on site; however, rock greater than
6-inches may run 50 to 60 percent. Waterholding
capabilities appear good.

SITE NA-0606 (Cont'd)

Engineering
Notes:

The recommended location for an excavated emergency spillway is at the right abutment. Waterholding capabilities appear good providing a cutoff is made beneath the swamp in the foundation. Preliminary structure designs indicate that a concrete emergency spillway (chute or drop structure) may be needed to avoid excessive velocity in an excavated emergency spillway.

Public
Ownership:

About 5% of the site is owned by the Town of Princeton.

SITE NA-0607

Location:

On Justice Brook approximately 1800 feet upstream from Route 140 in Sterling, Massachusetts. A small section near the dam is in Princeton, Massachusetts.

Sterling, Massachusetts Quadrangle.

Latitude: 42°28'19"

Longitude: 71°49'41"

Facilities
Affected:

Below elevation 655

5 houses

8 barns and sheds

1 farm

2700 feet of Justice Hill Road cutoff

2200 feet of Justice Hill Road

Below elevation 645

4 houses

8 barns and sheds

1 farm

2700 feet of Justice Hill Road cutoff

2200 feet of Justice Hill Road

Below elevation 630

2 houses

1 barn

1200 feet of Justice Hill Road cutoff

700 feet of Justice Hill Road

Below elevation 620

1 house

600 feet of Justice Hill Road cutoff

400 feet of Justice Hill Road

SITE NA-0607 (Cont'd)

Geologic
Conditions:

Both abutments are poorly graded sand and gravel englacial drift or silty sand glacial till -- probably shallow to basalt bedrock. Depth to basaltic bedrock in the foundation is not known, but may be 10 to 20 feet. There are no apparent leakage problems. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear good.

Engineering
Notes:

The recommended location for an emergency spillway is at the left abutment.

Public
Ownership:

About 15% of the site is owned by the Massachusetts Department of Natural Resources.

SITE NA-0608

Location:

On the Stillwater River approximately 2400 feet upstream from Houghton Road in Princeton, and Sterling, Massachusetts.

Sterling, Massachusetts Quadrangle.

Latitude: 42°27'31" Longitude: 71°49'25"

Facilities
Affected:

About 1.7 miles of Redemption Rock Trail (Route 140).

Geologic
Conditions:

The left abutment is poorly graded sand and gravel englacial drift or silty sand glacial till with swamp at low elevations. The right abutment is poorly graded sand and gravel glacial till with swamp at low elevations. Both abutments are probably shallow to bedrock. There are basaltic rock outcroppings in the western-most stream. There are leakage problems in the foundation. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear fair.

SITE NA-0608 (Cont'd)

Engineering
Notes:

The recommended location for an excavated emergency spillway is at the left abutment. Waterholding capabilities appear fair depending on a cutoff through the swamp deposits in the foundation. There is a seep high on the right abutment which may need to be drained.

Preliminary structure designs indicate that a concrete chute emergency spillway will be needed to avoid excessive velocity in an excavated emergency spillway.

NA-0609 -- HYCREST POND

Location: On Rocky Brook, 200 feet upstream of
Upper North Row in Sterling, Massachusetts.

Sterling, Massachusetts Quadrangle

<u>Surface Area</u> <u>(Acres)</u>	<u>Height of Dam</u> <u>(Ft.)</u>	<u>Drainage Area</u>	
		<u>(Acres)</u>	<u>(Sq. Mi.)</u>
91	15	474	0.74

Potential
for
Expansion:

Small drainage area limits expansion.

Remarks:

This is an earth-fill dam. Spillway system is a cast iron pipe and an over-flow weir section. The weir is about 10 feet wide and 5 feet deep. Spillway is in fair condition. The dam has many trees growing on the slopes.

SITE NA-0610

Location: On Rocky Brook approximately 2700 feet downstream from Justice Hill Road in Sterling, Massachusetts.

Sterling, Massachusetts Quadrangle.

Latitude: 42°27'48" Longitude: 71°48'03"

Facilities

Affected:

Below elevation 690

1 house

3 barns

4800 feet of Justice Hill Road

2150 feet of power lines

Below elevation 670

2 barns

980 feet of Justice Hill

Road

2150 feet of power lines

Below elevation 680

1 house

2 barns

4800 feet of Justice Hill Road

2150 feet of power lines

Geologic

Conditions:

The left abutment has basalt outcrops at high elevations, and schist and basalt bedrock outcrops and gravel terrace at low elevations. The right abutment has basalt and schist bedrock outcrops at high elevations and gravel terrace and swamp at low elevations. Depth to basalt and/or schist bedrock in the foundation is not known, but may be 10 to 20 feet. There are leakage problems low on both abutments. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear fair.

Engineering

Notes:

The recommended location for an emergency spillway is at the right abutment. Waterholding capabilities appear to be good providing cutoff is made to bedrock beneath the gravel terraces and swamps low on both abutments.

SITE NA-0611

Location: On Rocky Brook approximately 2200 feet upstream
from Beaman Road in Sterling, Massachusetts.

Sterling, Massachusetts Quadrangle.

Latitude: 42°27'16" Longitude: 71°47'50"

Facilities
Affected:

Below elevation 615
1 house
2150 feet of underground telephone cable
1 shed

Below elevation 600
1 house
1900 feet of underground telephone cable
1 shed

Below elevation 580
1 house
1100 feet of underground telephone cable
1 shed

Geologic
Conditions:

Both abutments are silty sand glacial till, very shallow to bedrock. There are numerous outcrops of basalt and schist at middle and high elevations. Depth to basalt bedrock in the foundation is not known, but may be 10 to 20 feet. There are no apparent leakage problems. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear good.

Engineering
Notes:

The recommended location for an emergency spillway is at the right abutment.

SITE NA-0612

Location: On Stillwater River approximately 3400 feet
upstream from Route 62 in Sterling, Massachusetts.

Sterling, Massachusetts Quadrangle.

Latitude: 42°26'34" Longitude: 71°48'42"

Facilities

Affected: Below elevation 470
3 houses
3 garages and sheds
3700 feet of power lines
2000 feet of Route 140
1000 feet of Beaman Road

Below elevation 450
1 house
3 garages and sheds
3700 feet of power lines
1900 feet of Route 140

Geologic

Conditions: Both abutments are silty sand (SM) glacial till
at high elevations, with outcrops of Basaltic
bedrock. Right abutment is poorly graded sand
and gravel, outwash sand and gravel terrace and
swamp at lower elevations. Left abutment is
outwash and swamp at lower elevations. Depth to
bedrock in foundation is not known, but probably
shallow 10 to 20 feet to basalt bedrock. Leakage
problems on both abutments and foundation.
Impervious borrow was not located on site. Water-
holding capability is poor.

Engineering

Notes: Recommended location for an excavated emergency
spillway is at the right abutment. Preliminary
structure designs indicate that a concrete chute
emergency spillway will be needed to avoid
excessive velocity in an excavated emergency
spillway.

Public

Ownership: About 10% of the site is owned by the Metropolitan
District Commission. Two percent of the site is
owned by the Town of Sterling.

SITE NA-0613

Location: On Scanlon Brook approximately 5200 feet
upstream from Route 140 in Sterling,
Massachusetts.
Sterling, Massachusetts Quadrangle.
Latitude: $42^{\circ}24'57''$ Longitude: $71^{\circ}49'16''$

Engineering
Notes: This site did not meet criteria for this study
due to the small contributing drainage area
(196 acres); therefore, no further investigations
were made.

SITE NA-0614

Location: On Scanlon Brook approximately 1100 feet
upstream from Route 140 in Sterling, Massachusetts.
Sterling, Massachusetts Quadrangle.
Latitude: $42^{\circ}26'34''$ Longitude: $71^{\circ}48'42''$

Facilities
Affected: No facilities affected below elevation 590.

Geologic
Conditions: Both abutments are silty sand glacial till,
shallow to bedrock, with outcrops of basaltic
bedrock high on the left abutment. Depth to
basalt bedrock in the foundation is not known,
but may be 10 to 20 feet. There are no apparent
leakage problems. Impervious borrow material for
dam construction is available on site; however,
rock greater than 6-inches may run 30 percent.
Waterholding capabilities appear good.

Engineering
Notes: The recommended location for an emergency spillway
is at the right abutment.

SITE NA-0615

Location: On Tannery Brook approximately 3000 feet upstream
from Route 62 in Sterling, Massachusetts.

Sterling, Massachusetts Quadrangle.

Latitude: $42^{\circ}26'32''$ Longitude: $71^{\circ}46'21''$

Facilities

Affected:

Below elevation 625

2 houses

1 shed

1700 feet of an unnamed road

Below elevation 615

1 house

1700 feet of an unnamed road

Geologic

Conditions:

The right abutment is silty sand glacial till with numerous outcroppings of schist and basalt at all elevations. The left abutment is silty sand glacial till with schist and basalt outcrops at high elevations and poorly graded sand and gravel terrace and swamp at low elevations. There are leakage problems low on the left abutment and at the swamp on the left of the stream. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear fair to good.

Engineering

Notes:

The recommended location for an emergency spillway is at the right abutment. Waterholding capabilities appear good providing a cutoff is made to either glacial till or bedrock beneath the swamp and the gravel terrace low on the left abutment.

SITE NA-0616

Location: On Tannery Brook approximately 1100 feet upstream from Jewett Road in Sterling, Massachusetts.

Sterling, Massachusetts Quadrangle

Latitude: $42^{\circ}25'34''$ Longitude: $71^{\circ}46'32''$

Facilities

Affected:

Below Elevation 510

Below Elevation 470

6 houses

1 house

2 barns

1 shed

rock crushing plant

fuel oil company

900 feet of Princeton Road (Route 62)

475 feet of Jewett Road

Below Elevation 495

2 houses

2 barns

rock crushing plant

fuel oil company

475 feet of Jewett Road

Geologic
Conditions:

The left abutment is basaltic rock with a gravel terrace and swamp at low elevations. The right abutment is basaltic rock at the surface and at high elevations, with gravel terrace and swamp at low elevations. Depth to basaltic bedrock in the foundation is not known, but may be 15 to 25 feet. There are leakage problems in the gravel terrace on both abutments. Impervious borrow material for dam construction was not located on site. Water-holding capabilities appear good providing a cutoff is made through the gravel terrace and swamp low on both abutments.

Engineering
Notes:

The recommended location for an emergency spillway is at the right abutment.

SITE NA-0617

Location: On a tributary to Waushaccum Brook approximately 1200 feet upstream from Route 12 in West Boylston, Massachusetts.

Sterling, Massachusetts Quadrangle

Latitude: $42^{\circ}23'40''$ Longitude: $71^{\circ}46'02''$

Facilities

Affected: Below Elevation 470
10 houses
4 barns
600 feet of power lines
1800 feet of Fairbanks Street

Below Elevation 460
3 houses
4 barns
600 feet of power lines
1800 feet of Fairbanks Street

Below Elevation 455
1 house
4 barns
450 feet of Power lines
1000 feet of Fairbanks Street

Geologic
Conditions:

The right abutment is silty sand glacial till with outcrops of basalt and schist and swampy at low elevations. The left abutment is basalt and schist with poorly graded sand and gravel outwash and swampy at low elevations. Depth to basalt or schist bedrock in the foundation is not known, but is probably 10 to 20 feet. There are leakage problems in the foundation and low on the left abutment. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear fair to good providing a positive cutoff can be made to either glacial till or bedrock beneath the swamp in the foundation and low on the left abutment.

Engineering
Notes:

The recommended location for an emergency spillway is at the right abutment.

SITE NA-0618

Location: On Malden Brook approximately 150 feet upstream
from Malden Street in West Boylston, Massachusetts.

Worcester North, Massachusetts Quadrangle.

Latitude: 42°22'17"

Longitude: 71°47'58"

Facilities

Affected:

Below elevation 580

14 houses

1 barn

1250 feet of Goodale Street

Below elevation 570

5 houses

1 barn

550 feet of Goodale Street

Below elevation 560

1 house

100 feet of Goodale Street

Geologic

Conditions:

Both abutments are outwash sand and gravel at the toe of the slopes with silty sand glacial till high on the slopes. Depth to schist bedrock in the foundation is not known, but may be 30 to 35 feet. There are leakage problems in both abutments. Impervious borrow material for dam construction is available on site; however, rock greater than 6-inches may run 15 percent. Waterholding capabilities appear fair.

Engineering

Notes:

The recommended location for an emergency spillway is at the left abutment. Waterholding capabilities may be good if a cutoff can be made to glacial till or bedrock.

Public

Ownership:

The Metropolitan District Commission controls water rights on this stream.

SITE NA-0619

Location: On South Meadow Brook approximately 400 feet upstream from Fitch Pond Road in Sterling, Massachusetts.

Clinton, Massachusetts Quadrangle.

Latitude: 42°25'08" Longitude: 71°43'54"

Remarks:

Drainage Area -- 725 Acres.

This site did not meet criteria for this study. At the 10 to 1 drainage area to pond area ratio, the depth at dam is less than 7 feet and storage less than 100 acre feet; therefore, no further investigations were made.

SITE NA-0620

Location: On a tributary to South Meadow Pond approximately 400 feet upstream from end of pond in Clinton, Massachusetts.

Clinton, Massachusetts Quadrangle.

Latitude: 42°25'08" Longitude: 71°42'54"

Facilities
Affected:

Below elevation 380

4 houses
3 barns
1 shed
525 feet of Chace Hill Road
1200 feet of Moffet Road

Below elevation 375

1 house
1 barn
400 feet of Chace Hill Road
1200 feet of Moffet Road

SITE NA-0620 (Cont'd)

Geologic
Conditions:

The right abutment is silty sand glacial till at high elevations and swamp at toe of abutment. The left abutment is poorly graded sand and gravel at high elevations and swamp at low elevations. Depth to bedrock in the foundation is unknown. There are leakage problems in the foundation and the left abutment. Impervious borrow material for dam construction is available on site; however, rock greater than 6 inches may run 30 percent. Waterholding capabilities appear poor because of the outwash on the left abutment.

Engineering
Notes:

The recommended location for an emergency spillway is at the right abutment.

SITE NA-0621

Location:

At South Meadow Pond approximately 500 feet downstream from Meadow Road Causeway in Clinton, Massachusetts.

Clinton, Massachusetts Quadrangle

Latitude: 42°24'52" Longitude: 71°42'32"

Facilities
Affected:

<u>Below Elevation 370</u>	<u>Below Elevation 340</u>
7 cottages	6 cottages
1 barn	1 shed
1 shed	3000 feet of Meadow Road
3000 feet of Meadow Road	
<u>Below Elevation 350</u>	<u>Below Elevation 330</u>
7 cottages	4 cottages
1 shed	3000 feet of Meadow Road
3000 feet of Meadow Road	

Geologic
Conditions:

Both abutments are poorly graded sand and gravel outwash. Depth to bedrock in the foundation is not known. There are leakage problems in both abutments. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear poor.

Engineering
Notes:

The recommended location for an emergency spillway is at the left abutment.

SITE NA-0622

Location: On Houghton Brook approximately 1150 feet
upstream from Route 140 in Sterling,
Massachusetts.

Sterling, Massachusetts Quadrangle

Latitude: 42°24'45" Longitude: 71°48'12"

Facilities
Affected:

Below Elevation 495

2 houses
3 garages
1 shed
2 barns

Below Elevation 490

2 houses
1 shed
1 garage

Geologic
Conditions:

The left abutment is silty sand glacial till at high elevations and poorly graded sand and gravel outwash and swamp at low elevations. The right abutment is poorly graded sand and gravel and swamp at low elevations. Depth to granitic bedrock in the foundation is not known, but may be 15 to 25 feet. There are leakage problems in both abutments and the foundation. Impervious borrow material for dam construction is available on site; however, rock greater than 6-inches may run 30 percent. Waterholding capabilities appear poor due to swamp across the foundation and outwash sand and gravel low on the left abutment and on the right abutment.

Engineering
Notes:

The recommended location for an emergency spillway is at the right abutment.

SITE NA-0623

Location: On Bailey Brook approximately 400 feet upstream
from Beaman Road in Sterling, Massachusetts.

Sterling, Massachusetts Quadrangle

Latitude: 42°27'04" Longitude: 71°48'27"

Remarks:

This site did not meet criteria for this study due to the small contributing drainage area (215 acres); therefore, no further investigations were made.

NA-0624 -- STUART POND

Location: Near Justice Hill Road cutoff in
Sterling, Massachusetts.

Sterling, Massachusetts Quadrangle

<u>Surface Area</u> <u>(Acres)</u>	<u>Height of Dam</u> <u>(Ft.)</u>	<u>Drainage Area</u> <u>(Acres)</u>	<u>(Sq. Mi.)</u>
36	12	2570	4.02

Potential
for
Expansion: Could be expanded.

Remarks: This is an old mill dam in poor condition;
downstream slope is a vertical stone wall.
The outlet structure, located south of
Justice Hill Road is a 12-inch diameter
pipe with a gate. Seepage through the dam
was noted.

Geologic
Conditions: Both abutments are silty sand glacial till.
There is a slightly swampy area 30 feet
up on the right abutment. Depth to schist
bedrock in the foundation is not known, but may
be 15 to 25 feet. There are leakage problems
in the right abutment. Impervious borrow
material for dam construction is available on
site; however, rock greater than 6-inches may
run 30 percent. Waterholding capabilities
appear good.

SITE NA-0625

Location: On Gates Brook approximately 500 feet upstream
from Woodland Street in West Boylston, Massachusetts.

Worcester, North, Massachusetts Quadrangle.

Latitude: $42^{\circ}20'26''$ Longitude: $71^{\circ}47'39''$

Facilities

Affected: This site was eliminated from further study due
to excessive facilities affected. (Quabbin Aqueduct)

Geologic

Conditions: The right abutment is silty sand glacial till
with swamp at low elevations. The left abutment
is silty sand glacial till with outcrops of
schist at high elevations and swamp at low
elevations. Depth to schist bedrock in the
foundation is not known, but may be 15 to 25 feet.
There are leakage problems in the foundation.
Impervious borrow material for dam construction is
available on site; however, rock greater than
6-inches may run 30 percent. Waterholding
capabilities appear poor.

Engineering

Notes: The recommended location for an emergency spillway
is at the left abutment. Waterholding capabilities
appear poor due to outwash sand and gravel and
swamps on both abutments and the foundation.

SITE NA-0626

Location: On Bartlet Pond Brook approximately 350 feet downstream
from Elm Street in Leominster, Massachusetts.

Sterling, Massachusetts Quadrangle.

Latitude: $42^{\circ}29'50''$ Longitude: $71^{\circ}49'17''$

Facilities

Affected: Below elevation 775
5 houses
1 barn
1 sports club
1 skeet house
2300 feet of Wachusett Street
3850 feet of Elm Street

SITE NA-0626 (Cont'd)

Facilities

Affected:
(Cont'd)

Below elevation 765

4 houses

1 barn

1 sports club

1 skeet house

2300 feet of Wachusett Street

3850 feet of Elm Street

Below elevation 760

1 house

1 barn

3850 feet of Elm Street

950 feet of Wachusett Street

Geologic

Conditions:

Both abutments are silty sand glacial till, probably shallow to schist bedrock. Depth to schist bedrock in the foundation is not known, but may be 15 to 25 feet. There are no apparent leakage problems. Impervious borrow material for dam construction is available on site; however, rock greater than 6-inches may run 40 percent. Waterholding capabilities appear good.

Engineering

Notes:

The recommended location for an emergency spillway is at the left abutment.

Public

Ownership:

About 60% of the site is owned by the City of Leominster.

SITE NA-0627

Location:

On Keyes Brook approximately 2700 feet upstream from Hobbs Road in Princeton, Massachusetts.

Sterling, Massachusetts Quadrangle.

Latitude: 42°29'46"

Longitude: 71°51'20"

Facilities

Affected:

Below elevation 830

2 houses

2000 feet of Route 140

5000 feet of Fitchburg Road

Paradise Pond

Below elevation 820

1 house

2000 feet of Route 140

5000 feet of Fitchburg Road

Paradise Pond

SITE NA-0627 (Cont'd)

Geologic
Conditions:

Both abutments are englacial drift with a thin gravel terrace. Depth to schist bedrock in the foundation is not known, but may be 30 to 40 feet. There are leakage problems in both abutments. Impervious borrow material for dam construction is available on site, but contains cobbles and boulders. Waterholding capabilities appear fair to poor depending on the extent of the outwash terrace gravel.

Engineering
Notes:

The recommended location for an emergency spillway is at the left abutment.

Public
Ownership:

About 90% of the site is owned by the Massachusetts Department of Natural Resources.

SITE NA-0628

Location:

On Goodridge Brook approximately 700 feet upstream from Sterling Street in Sterling, Massachusetts.

Clinton, Massachusetts Quadrangle

Latitude: $42^{\circ}26'22''$ Longitude: $71^{\circ}43'13''$

Facilities
Affected:

Below Elevation 455
 1 house
 1 garage
1000 feet of Wiles Road

Geologic
Conditions:

Both abutments are silty sand glacial till probably shallow to schist bedrock. There is a swamp low on the left abutment. Depth to schist bedrock in the foundation is not known, but may be 15 to 25 feet. There are leakage problems in the foundation on the left side of the stream. Impervious borrow material for dam construction is available on site; however, rock greater than 6-inches may run 20 percent. Waterholding capabilities appear good, provided a cutoff can be made to glacial till beneath the swamp area low on the left abutment.

SITE NA-0628 (Cont'd)

Engineering
Notes:

The recommended location for an emergency spillway is at the right abutment.

SITE NA-0629

Location:

On Goodridge Brook approximately 1200 feet from Fuller Pond in Lancaster, Massachusetts.

Clinton, Massachusetts Quadrangle

Latitude: $42^{\circ}26'12''$ Longitude: $71^{\circ}41'30''$

Facilities
Affected:

Below Elevation 340
8 houses

Below Elevation 335
2 houses

Geologic
Conditions:

The right abutment is poorly graded sand kame deposits and poorly graded sand and gravel outwash. The left abutment is poorly graded sand and gravel with swamp at lower elevations. Depth to bedrock in the foundation is not known. There are leakage problems in both abutments and the foundation. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear poor due to outwash on both abutments and the foundation.

Engineering
Notes:

The recommended location for an emergency spillway is at the right abutment.

SITE NA-0630

Location: On South Meadow Brook approximately 1600 feet upstream from South Meadow Pond in Sterling, Massachusetts.

Clinton, Massachusetts Quadrangle

Latitude: $42^{\circ}24'37''$ Longitude: $71^{\circ}43'12''$

Facilities Affected: No facilities affected below elevation 380.

Geologic Conditions: The left abutment is poorly graded sand and gravel outwash with schist at the highest elevations and swamp at the low elevations. The right abutment is poorly graded sand and gravel outwash. Depth to schist bedrock in the foundation is not known. There are leakage problems in both abutments and the foundation. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear poor because of outwash on both abutments.

Engineering Notes: The recommended location for an emergency spillway is at the left abutment.

Public Ownership: This site is owned by the Metropolitan District Commission.

NA-0631 -- WEST WAUSHACCUM POND

Location: Near Gates Road in Sterling, Massachusetts
Sterling, Massachusetts Quadrangle
Latitude: $42^{\circ}24'36''$ Longitude: $71^{\circ}45'54''$

Surface Area (Acres)	Drainage Area (Acres)	(Sq. Ft.)
<u>135</u>	<u>3280</u>	<u>5.12</u>

Potential
for
Expansion: Limited by cottages, railroad, and powerlines

Remarks: The outlet for East Waushaccum Pond passes under
Newell Hill Road into West Waushaccum Pond.
The outlet at West Waushaccum is two 48 inch
culverts under Gates Road. The road acts as a dam.
No photos were taken.

SITE NA-0632

Location: At outlet to Scotland Swamp approximately
800 feet upstream from French Brook in
Boylston, Massachusetts.
Shrewsbury, Massachusetts Quadrangle
Latitude: $42^{\circ}21'50''$ Longitude: $71^{\circ}42'39''$

Engineering
Notes: This site did not meet criteria for this study
due to the small contributing drainage area,
(119 acres); therefore, no further investigations
were made.

SITE NA-0633

Location: On a tributary to French Brook approximately
200 feet upstream from Linden Street in
Boylston, Massachusetts.

Shrewsbury, Massachusetts Quadrangle

Latitude: $42^{\circ}20'41''$ Longitude: $71^{\circ}42'42''$

Facilities

Affected: Below Elevation 525 Below Elevation 515
1 house 1000 feet of Linden Street
1500 feet of Linden Street

Below Elevation 520 Below Elevation 510
1 house 625 feet of Linden Street
1375 feet of Linden Street

Geologic

Conditions: The right abutment is hornblende-biotite gneiss
bedrock overlain by silty sand glacial till,
poorly sorted sand and gravel outwash, and swamp
at low elevation. The left abutment is poorly
graded sand and gravel outwash, probably shallow to
bedrock, with swamp at low elevations and glacial till
at higher elevations. Depth to hornblende-biotite
gneiss bedrock is not known, but may be 15 to 25 feet.
Impervious borrow material for dam construction was
not located on site. Waterholding capabilities
appear fair to poor due to outwash sand and gravel
on the left abutment.

Engineering

Notes: The recommended location for an emergency spillway
is at the right abutment.

SITE NA-0634

Location: On French Brook approximately 500 feet upstream
from Main Street in Boylston, Massachusetts.

Shrewsbury, Massachusetts Quadrangle

Latitude: $42^{\circ}22'03''$ Longitude: $71^{\circ}43'24''$

SITE NA-0634 (Cont'd)

Facilities
Affected:

Below Elevation 500

13 houses
1 shed
2 swimming pools
500 feet of Cross Street
650 feet of Linden Street

Below Elevation 495

10 houses
1 shed
2 swimming pools
425 feet of Cross Street

Below Elevation 490

2 houses
350 feet of Cross Street

Geologic
Conditions:

Both the abutments are silty sand glacial till, probably shallow to bedrock, with swamp at low elevation. Depth to phyllite bedrock in the foundation is not known, but may be 15 to 25 feet. There are leakage problems in the foundation. Impervious borrow material for dam construction is available on site; however, rock greater than 6 inches may run to 20 percent. Waterholding capabilities appear good provided a cutoff is made to glacial till beneath the swamp in the foundation.

Engineering
Notes:

The recommended location for an emergency spillway is at the right abutment.

Public
Ownership:

About 20% of the site is owned by the Metropolitan District Commission.

NA-0635 -- PARADISE POND

Location: On Keyes Brook near the intersection of
Routes 140 and 31 in Princeton, Massachusetts.
Sterling, Massachusetts Quadrangle.

<u>Surface Area</u> <u>(Acres)</u>	<u>Height of Dam</u> <u>(Ft.)</u>	<u>Drainage Area</u> <u>(Acres)</u>	<u>(Sq. Mi.)</u>
61	10	1285	2.0

Potential
for
Expansion: See data for potential site NA-0627 which
is about 900 feet downstream.

Remarks: This is an old mill dam with a stone
retaining wall at the downstream slope.
The spillway is a 6 foot wide rock chute
over the dam. The dam has washed out at
the left side. Entire structure is in
poor condition.

NA-0636 -- BARTLETT POND

Location: Near Elm Road and Wachusett Street in
Leominster, Massachusetts.

Sterling, Massachusetts Quadrangle

<u>Surface Area</u> (Acres)	<u>Height of Dam</u> (Ft.)	<u>Drainage Area</u>	
		(Acres)	(Sq. Mi.)
20	15	973	1.52

Potential
for
Expansion:

Expansion is possible, but extensive diking
would be required.

Remarks:

The dam is a concrete weir with a 12 foot wide,
3 foot deep weir spillway. Flows discharge
onto a stone masonry ramp.

NA-0637 -- WACHUSETT RESERVOIR

Location: In the southwest corner of Clinton,
Massachusetts.

Clinton, Massachusetts Quadrangle.

<u>Surface Area</u> <u>(Acres)</u>	<u>Height of</u> <u>Dam (Ft.)</u>	<u>Drainage</u> <u>(Acres)</u>	<u>Area</u> <u>(Sq. Mi.)</u>
4135	114	69,120	108

Potential
for
Expansion:

The site appears to be developed to its full
potential.

Remarks:

Wachusett Reservoir is part of the Metro-
politan District Commission system
providing water for communities in the
Boston area. The structure is a large
granite block dam. There is a 450 foot
long overflow weir at the left abutment.



NA-0638 -- COACHLACE POND

Location: West of Route 110 in Clinton,
Massachusetts.

Clinton, Massachusetts Quadrangle

Surface Area (Acres)	Drainage Area	
	(Acres)	(Sq. Mi.)
119*	2571	4.02

Potential
for
Expansion: Limited by the Boston and Maine Railroad
along the north shore.

Remarks: The structure consists of a concrete weir
section with four bays. The outlet channel
is about 25 feet wide and 15 feet deep.
Overall condition of the structure and
channel is poor. The structure appears to
control water levels in South Meadow Pond
and Mossy Pond.

* Area of South Meadow, Mossy, and Coachlace Ponds

SUBWATERSHED-STILLWATER RIVER

NOTES - (1) COSTS ARE BASED ON 1971 S.C.S. DESIGN CRITERIA AND COST DATA.

(3) EMERGENCY SPILLWAY TYPE CODE- C=CONCRETE CHUTE, D=CONCRETE DROP, E=EXCAVATED, I= TWO SPILLWAYS, N= NONE

(4) TABULAR DATA ARE BASED ON PRELIMINARY INFORMATION. FIGURES SHOWN ARE PRIMARILY FOR COMPARISON PURPOSES.

(5) ELEVATIONS ARE SHOWN TO THE NEAREST 0.1 FOOT TO SHOW VARIATION BETWEEN DEVELOPMENTS ONLY, AND ARE NOT TO BE CONSIDERED ACCURATE TO THAT DEGREE.

*** DO NOT USE FOR FINAL SITE SELECTION OR LAND ACQUISITION. ***

SUMMARY DATA FOR POTENTIAL UPSTREAM RESERVOIR SITES

STUDY AREA-NASHUA RIVER										SUBWATERSHED-STILLWATER RIVER									
BENEFICIAL POOL										EMERGENCY SPILLWAY									
ELEV	STORAGE	PER AC FT	AREA	COST/AC	DEPTH	AT	CREST	STORAGE	AT CREST	COST PER AC FT	ELEV	AREA	ELEV	TOP	HGT	FILL VOL	PERCENT CHANCE	YIELD	SAFE
(MSL)	AC FT	IN	(\$)	(AC)	(FT)	DAM	TYPE	AC FT	IN	(\$)	(MSL)	(AC)	(MSL)	(AC)	(MSL)	FT	CY	(1000)	(MGD)
NA-0608										LATITUDE 42-27-31 LONGITUDE 71-49-25									
SITE RATING (2)										RUNOFF = 8.10 IN, PEAK FLOW = 1480 CFS									
514.5	0	0.0	19	32	10.5	14.7	557.5	E	3912	6.6	970	559.7	185	565.2	61	556	556	0.46	0.46
518.8	100	0.2	34450	103	41540	36.5	540.5	T	188	0.3	18320	533.0	78	536.7	33	133	435	2.93	2.93
540.5	1557	2.7	2750	103	41540	36.5	540.5	T	1645	2.8	2610	555.0	158	559.0	55	435	853	5.43	5.43
561.2	4470	7.6	1100	193	23570	57.1	561.2	T	4558	7.8	1080	573.4	250	577.5	74	853	1686	8.05	8.05
585.0	10297	17.6	560	289	20080	81.0	595.5	E	13719	23.4	420	597.7	353	602.4	98	1686	1748	9.01	9.01
596.5	13980	23.7	490	346	19610	92.5	596.5	T	14068	24.0	480	601.4	372	603.9	100	1748			
NA-0610										LATITUDE 42-27-48 LONGITUDE 71-48-03									
SITE RATING (2)										RUNOFF = 8.10 IN, PEAK FLOW = 244 CFS									
617.8	0	0.0	3	15	7.8	19.7	639.5	E	310	4.1	5180	641.4	27	643.2	33	57	29	0.24	0.24
629.8	100	1.2	15760	32	58300	34.9	647.4	E	549	7.3	3360	649.8	37	651.2	41	110	258	0.90	0.90
644.9	453	6.1	4070	46	47460	48.5	661.0	E	1115	14.8	1970	663.0	53	664.5	55	484	538	1.13	1.13
658.5	983	13.2	2230	67	43860	61.0	673.5	E	1878	25.2	1560	675.4	74	676.9	67	538			
671.0	1690	22.6	1740	71	42440	63.5	676.0	E	2055	27.5	1470	677.8	78	679.4	69	538			
673.5	1867	25.0	1610																
NA-0611										LATITUDE 42-27-16 LONGITUDE 71-47-50									
SITE RATING (1)										RUNOFF = 8.10 IN, PEAK FLOW = 314 CFS									
549.9	0	0.0	4	29	7.8	33.8	577.5	E	398	4.1	2380	579.7	35	581.7	40	57	80	0.56	0.56
575.8	330	3.4	3450	64	20580	44.5	589.0	E	981	10.2	1350	591.2	83	592.9	51	129	227	1.25	1.25
586.5	790	8.2	1670	93	16940	53.0	597.5	E	1730	18.0	910	599.5	105	601.2	59	370			
595.0	1480	15.3	1070	116	16250	61.6	606.2	E	2702	28.0	700	607.9	127	609.7	68				
603.7	2400	25.0	790																

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 (5) ELEVATIONS ARE SHOWN TO THE NEAREST 0.1 FOOT TO SHOW VARIATION BETWEEN DEVELOPMENTS ONLY, AND ARE NOT TO BE CONSIDERED ACCURATE TO THAT DEGREE.

** DO NOT USE FOR FINAL SITE SELECTION OR LAND ACQUISITION. **

SUMMARY DATA FOR POTENTIAL UPSTREAM RESERVOIR SITES

[illegible]

DO NOT USE FOR FINAL SITE SELECTION OR LAND ACQUISITION.

SUMMARY DATA FOR POTENTIAL UPSTREAM RESERVOIR SITES

STUDY AREA-NASHUA RIVER										SUBWATERSHED-STILLWATER RIVER															
BENEFICIAL POOL																									
ELEV	STORAGE	PER AC FT	AREA (AC)	SURF AC	COST/	DEPTH AT DAM	CREST ELEV	STORAGE AT CREST	COST PER AC FT	DESIGN HIGH WATER	DAM	SAFE YIELD													
(MSL)	AC FT	IN	(AC)	(\$)	(FT)	(MSL)	AC FT	IN	(\$)	(MSL)	(AC)	(MGD)													
NA-0616													DA= 1.80 SQ MI = 1152 AC USGS QUAD- STERLING MASS												
SITE RATING (1)													STREAM WATER QUALITY (A) 100-YR PRIN SPWY DESIGN STORM RUNOFF = 8.10 IN, PEAK FLOW = 543 CFS												
460.5	0	0.0	5	4.6	482.2	E	398	4.1	1970	484.4	37	486.5	30	67											
470.5	100	1.0	15	57180	14.5	483.0	E	422	4.4	2080	485.4	39	487.2	31	72										
483.5	427	4.4	35	44830	27.5	490.0	E	706	7.3	2240	492.2	54	494.2	38	125										
494.0	917	9.6	59	31880	38.0	496.5	E	1078	11.2	1750	498.9	73	500.5	45	189										
502.5	1521	15.7	82	28220	46.5	505.0	E	1748	18.2	1330	507.0	94	508.9	53	295										
NA-0617													DA= 1.00 SQ MI = 640 AC USGS QUAD- STERLING MASS												
SITE RATING (2)													STREAM WATER QUALITY (A) 100-YR PRIN SPWY DESIGN STORM RUNOFF = 8.10 IN, PEAK FLOW = 302 CFS												
431.0	0	0.0	4	3.0	443.5	E	221	4.1	4170	445.0	36	446.5	19	26											
439.2	100	1.9	21	45640	11.3	441.7	E	168	3.2	5610	443.7	33	444.9	17	22										
447.2	347	6.5	42	25340	19.2	449.7	E	468	8.8	2300	451.2	53	452.5	25	45										
454.4	717	13.3	57	21570	26.4	456.9	E	873	16.4	1420	458.4	64	459.7	32	76										
460.4	1087	20.4	68	21230	32.4	462.9	E	1277	23.9	1120	464.0	82	465.5	37	109										
462.5	1238	23.2	76	19860	34.5	465.0	E	1449	27.2	1040	466.2	90	467.5	39	122										
NA-0618													DA= 0.90 SQ MI = 576 AC USGS QUAD- WORCESTER NORTH MASS												
SITE RATING (2)													STREAM WATER QUALITY (A) 100-YR PRIN SPWY DESIGN STORM RUNOFF = 8.10 IN, PEAK FLOW = 272 CFS												
498.7	0	0.0	3	4.6	516.8	E	199	4.1	3050	518.5	16	520.4	26	46											
510.5	100	2.0	14	46200	16.6	513.0	E	144	3.0	4480	515.4	15	516.8	23	34										
524.0	320	6.6	21	40620	30.0	526.5	E	385	8.0	2220	528.8	26	530.0	36	93										
536.3	650	13.5	32	34850	42.3	538.8	E	737	15.3	1490	540.7	35	542.2	48	187										
548.5	1090	22.7	41	33790	54.5	551.0	E	1202	25.0	1150	552.7	44	554.2	60	326										
551.0	1200	25.0	43	33680	57.0	553.5	E	1317	27.4	1100	555.3	47	556.8	63	363										

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SUMMARY DATA FOR POTENTIAL UPSTREAM RESERVOIR SITES

STUDY AREA-NASHUA RIVER										SUBWATERSHED-STILLWATER RIVER									
BENEFICIAL POOL										EMERGENCY SPILLWAY									
</																			

SUMMARY DATA FOR POTENTIAL UPSTREAM RESERVOIR SITES

[illegible]

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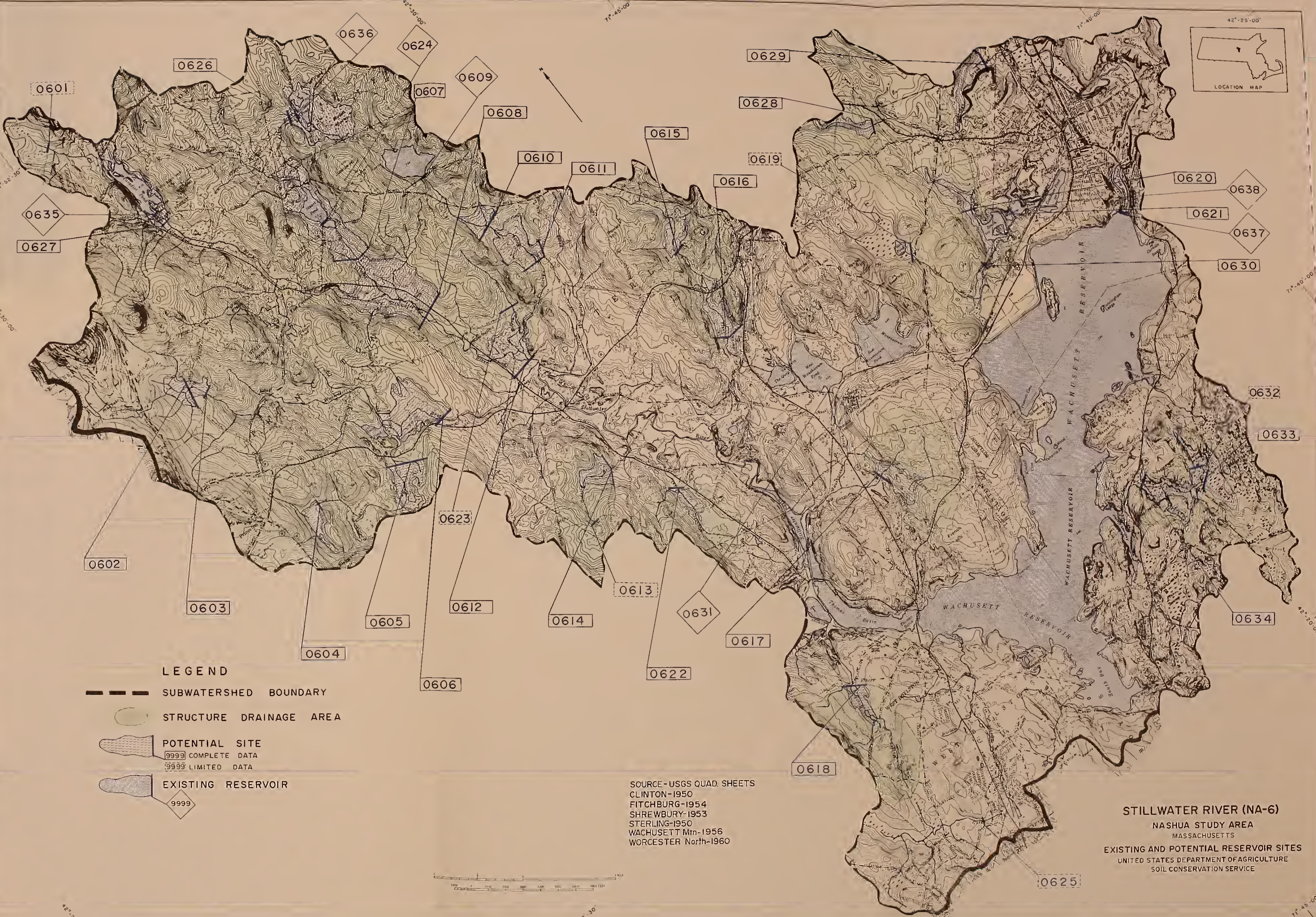
SUMMARY DATA FOR POTENTIAL UPSTREAM RESERVOIR SITES

STUDY AREA-NASHUA RIVER									
SUBWATERSHED-STILLWATER RIVER									
BENEFICIAL POOL									

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Notes



LEGEND

--- SUBWATERSHED BOUNDARY

STRUCTURE DRAINAGE AREA

POTENTIAL SITE

9999 COMPLETE DATA

9999 LIMITED DATA

EXISTING RESERVOIR

9999

SOURCE-USGS QUAD SHEETS
CLINTON-1950
FITCHBURG-1954
SHREWBURY-1953
STERLING-1950
WACHUSETT Mtn-1956
WORCESTER North-1960

STILLWATER RIVER (NA-6)

NASHUA STUDY AREA
MASSACHUSETTS

EXISTING AND POTENTIAL RESERVOIR SITES
UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

NASHUA STUDY AREA
SITE DATA FOR

Subwatershed NA-7, Nashua River

This subwatershed covers about 26,100 acres in the Bolton, Groton, Harvard, Lancaster, in Worcester County and Ayer and Shirley, in Middlesex County. Portions of Fort Devens, a U.S. Army Installation, lie within the subwatershed.

The Nashua River flows generally northerly through Fort Devens and Harvard.

The main tributary in the subwatershed is Bowers Brook which originates above Bare Hill Pond and flows northerly to Grove Pond in Ayer and then westerly to the Nashua River. Elevations range from a high of about 640 in Bolton to about 230 on the Nashua River floodplain. Geology within the subwatershed is variable consisting of schist, granitic gneiss or phyllite bedrock overlain by 15 to 50 feet of glacial till or outwash sand and gravel.

Seventeen potential reservoir sites and seven existing reservoirs were studied. Design summaries are included for 12 potential sites that met study criteria.

SITE NA-0701

Location: On a tributary to the Still River approximately 500 feet upstream from Still Forbush Mill Road in Bolton, Massachusetts.

Clinton, Massachusetts Quadrangle

Latitude: 42°26'46" Longitude: 71°38'12"

Facilities

Affected: About 1100 feet of an unnamed gravel road, below elevation 400.

Geologic

Conditions: The left abutment is outwash with schist bedrock outcrops near the stream on the left and outwash high on the abutment. The right abutment is outwash, probably shallow to schist bedrock. Depth to schist bedrock in the foundation is not known, but may be 15 to 20 feet. There are leakage problems in both abutments. Impervious borrow material for dam construction is available on site; however, rock greater than 6 inches in size may run 15 percent. Waterholding capabilities appear to be poor.

SITE NA-0701 (Cont'd)

Engineering
Notes:

The recommended location for an emergency spillway is at the left abutment.

SITE NA-0702

Location:

On a tributary to the Nashua River at Bolton-Harvard town line approximately 100 feet upstream from Route 110 in Bolton and Harvard, Massachusetts.

Clinton-Hudson, Massachusetts Quadrangle

Latitude: $42^{\circ}28'23''$ Longitude: $71^{\circ}37'30''$

Facilities
Affected:

Below Elevation 270

Below Elevation 260

6 houses

3 houses

2 sheds

1250 feet of Vaughn Hill Road

Below Elevation 255

1 house

Geologic
Conditions:

The left abutment is schist bedrock at high elevations and englacial drift at lower elevations and is shallow to bedrock. The right abutment is glacial till, probably shallow to bedrock, and swampy at low elevations. Depth to schist bedrock in the foundation is not known, but may be 15 to 25 feet. Impervious borrow material for dam construction is available on site; however, rock greater than 6-inches may run 30 percent. Waterholding capabilities appear fair if a positive cutoff can be made through the swamp deposits in the foundation and low on the right abutment.

Engineering
Notes:

The recommended location for an emergency spillway is at the right abutment.

SITE NA-0703

Location: On Bowers Brook approximately 600 feet
upstream from West Bare Hill Road in
Harvard, Massachusetts

Hudson, Massachusetts Quadrangle

Latitude: $42^{\circ}28'28''$ Longitude: $71^{\circ}36'09''$

Facilities

Affected:

Below Elevation 395

5 houses

800 feet of West Bare Hill Road

Below Elevation 390

3 houses

250 feet of West Bare Hill Road

Below Elevation 385

2 houses

Below Elevation 380

1 house

Geologic

Conditions:

The left abutment is glacial till, probably shallow to bedrock, with swamp at the lower elevations. The right abutment is glacial till at high elevations, outwash around till at middle elevations, and swamp at low elevations. Depth to granitic bedrock in the foundation is not known, but may be 15 to 25 feet. There are leakage problems low on the right abutment and in the foundation. Impervious borrow material for dam construction is available on site; however, rock greater than 6 inches in size may run 50 percent. Waterholding capabilities appear fair provided a cutoff is made to glacial till or bedrock beneath outwash on the left abutment and swamp.

Engineering

Notes:

The recommended location for an emergency spillway is at the right abutment.

SITE NA-0704

Location: At outlet end of marsh draining into Bare Hill Pond at southwest end of pond in Harvard, Massachusetts.

Hudson, Massachusetts Quadrangle

Latitude: $42^{\circ}28'51''$ Longitude: $71^{\circ}36'19''$

Remarks: This site did not meet criteria for this study due to the small contributing drainage area, (287 acres). Therefore, no further investigations were made.

SITE NA-0705

Location: On a tributary to the Nashua River in Fort Devens Military Reservation, approximately 6800 feet upstream from Nashua River in Lancaster, Massachusetts.

Clinton, Massachusetts Quadrangle

Latitude: $42^{\circ}29'09''$ Longitude: $71^{\circ}38'49''$

Facilities Affected: No facilities affected below elevation 250.

Geologic Conditions: Both abutments are poorly graded sand and gravel outwash. Depth to phyllite bedrock in the foundation is not known, but is probably 15 to 25 feet. There are leakage problems in both abutments and the foundation. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear poor due to outwash sand and gravel on both abutments and swamp on the foundation.

Engineering Notes: The recommended location for an emergency spillway is at the left abutment.

Public Ownership: The entire site is owned by the U.S. Army.

SITE NA-0706

Location: On a tributary to Nashua River approximately
1600 feet upstream from Union Turnpike on
the Fort Devens Military Reservation in
Lancaster, Massachusetts.

Shirley Massachusetts Quadrangle

Latitude: $42^{\circ}30'19''$ Longitude: $71^{\circ}39'21''$

Remarks: Drainage Area: 560 Acres
This site was eliminated from further study
since it is located on the Gunnery Impact area
of the Fort Devens Military Reservation.

Public
Ownership: The entire site is owned by the U.S. Army.

SITE NA-0707

Location: On a tributary to the Nashua River on Fort
Devens Military Reservation approximately
300 feet upstream from Jackson Road in
Lancaster, Massachusetts.

Shirley Massachusetts Quadrangle

Latitude: $42^{\circ}30'53''$ Longitude: $71^{\circ}38'13''$

Facilities
Affected: Below Elevation 240
1725 feet of Old Shirley Road
550 feet of Union Turnpike

Below Elevation 235
1150 feet of Old Shirley Road

Below Elevation 230
650 feet of Old Shirley Road

Geologic
Conditions: Both abutments are poorly graded sand and
gravel outwash. Depth to bedrock in the
foundation is not known. There are leakage
problems in both abutments. Impervious
borrow material for dam construction was
not located on site. Waterholding capabilities
appear poor due to outwash on both abutments.

Engineering
Notes: The recommended location for an emergency spill-
way is at the right abutment. The U.S. Army
has built a shallow fish and wildlife pond at
this site. The pool is known as Slate Rock
Pond and has a surface area of about 5 acres.
Waterholding capability above the present pool
level appears poor.

SITE NA-0707 (Cont'd)

Public
Ownership:

The entire site is owned by the U.S. Army.

SITE NA-0708

Location:

On a tributary to the Nashua River approximately
700 feet upstream from Route 2 in Lancaster,
Massachusetts.

Shirley, Massachusetts Quadrangle

Latitude: 42°31'13" Longitude: 71°38'31"

Remarks:

This site did not meet criteria for this study
due to the small contributing drainage area,
(233 acres). Therefore, no further investigations
were made.

SITE NA-0709

Location:

On Bower Brook approximately 300 feet upstream
from Route 2 in Harvard, Massachusetts.

Ayer, Massachusetts Quadrangle

Latitude: 42°31'18" Longitude: 71°34'24"

Facilities
Affected:

Below Elevation 310

25 houses
15 barns and sheds
3 garages
1 service station
1650 feet of Route 110-111
600 feet of Mill Road
5100 feet of Littleton Road
1600 feet of an unnamed road
2400 feet of Whitney Road

Below Elevation 290

10 houses
7 barns and sheds
2 garages
425 feet of Route 110-111
5100 feet of Littleton Road
1600 feet of an unnamed road
2400 feet of Whitney Road

Below Elevation 280

6 houses
4 barns
2 garages
250 feet of Route 110-111
5100 feet of Littleton Road
1600 feet of an unnamed road
2400 feet of Whitney Road

Below Elevation 300

16 houses
13 barns and sheds
3 garages
1150 feet of Route 110-111
5100 feet of Littleton Road
1600 feet of an unnamed road
2400 feet of Whitney Road

Below Elevation 270

4 houses
1 garage
5100 feet of Littleton Road
1600 feet of an unnamed road
2400 feet of Whitney Road

SITE NA-0709 (Cont'd)

Geologic
Conditions:

The right abutment is poorly graded fine and medium grained sand outwash. The left abutment is silty sand glacial till at high elevations and outwash sand and gravel at medium and low elevations. Depth to granitic gneiss bedrock in the foundation is not known, but may be 15 to 25 feet. There are leakage problems in both abutments. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear fair.

Engineering
Notes:

The recommended location for an emergency spillway is at the right abutment.

Public
Ownership:

About 5% of the site is owned by the Town of Harvard.

SITE NA-0710

Location:

On Bowers Brook approximately 1400 feet upstream from Barnum Road in Harvard, Massachusetts. Portion of this site is on Fort Devens Military Reservation.

Ayer, Massachusetts Quadrangle

Latitude: 42°32'54" Longitude: 71°34'41"

Remarks:

Drainage Area: 7163 Acres
This site was eliminated from further study because of the high cost of relocating a complex of Fort Devens Army buildings and a portion of the Boston and Maine Railroad.

Public
Ownership:

Portion of this site is on Fort Devens Military Reservation.

NA-0711 -- UPPER FLANAGAN POND

Location: 150 feet north of Flanagan's Pond
in Ayer, Massachusetts.

Ayer, Massachusetts Quadrangle

<u>Surface Area</u> (Acres)	<u>Height of Dam</u> (Ft.)	<u>Drainage Area</u>	
		<u>(Acres)</u>	<u>(Sq. Mi.)</u>
13	8	510	0.80

Potential
for
Expansion:

Size of pond could be tripled with little
effect on facilities.

Remarks:

This structure appears to be a mill dam
constructed of field stone and patched
with brick at a later date. A small weir
serves as the principal spillway, with high
flows going over the entire length of the
dam.

Geologic
Conditions:

The right abutment is thin discontinuous
englacial drift, shallow to granitic gneiss.
The left abutment is thin, poorly graded sand
and gravel outwash, shallow to granitic gneiss.
There is an outcropping of granitic gneiss at
the centerline of the dam in the brook. There
is a leakage problem low on the left abutment.
Impervious borrow material for dam construction
was not located on site. Waterholding capabilities
appear good providing a cutoff is made to bedrock
beneath the outwash sand and gravel on the left
abutment.

Engineering
Notes:

The recommended location for an emergency spillway
is at the left abutment.

SITE NA-0712

Location: On Walker Brook approximately 2500 feet
upstream from Walker Road in Shirley,
Massachusetts.

Ayer, Massachusetts Quadrangle

Latitude: $42^{\circ}33'38''$ Longitude: $71^{\circ}37'22''$

Facilities
Affected:

Below Elevation 260

5 powerline towers
1200 feet of Walker Road

Below Elevation 255

4 powerline towers

Geologic
Conditions:

Both abutments are poorly graded sand and
gravel outwash. Depth to schist bedrock
in the foundation is not known, but may be
30 to 40 feet. There are leakage problems
in both abutments and the foundation.
Impervious borrow material for dam construction
was not located on site. Waterholding
capabilities appear poor.

Engineering
Notes:

The recommended location for an emergency
spillway is at the right abutment.

SITE NA-0713

Location: On Morse Brook approximately 6200 feet
from Walker Road in Shirley, Massachusetts.
Shirley Massachusetts Quadrangle
Latitude: 42°33'29" Longitude: 71°37'59"

Remarks: This site did not meet criteria for this study
due to the small contributing drainage area,
(276 acres). Therefore, no further investigations
were made.

SITE NA-0714

Location: On a tributary to the Nashua River on Fort
Devens Military Reservation, approximately
1400 feet upstream from Nashua River in
Lancaster, Massachusetts.
Clinton Massachusetts Quadrangle
Latitude: 42°29'38" Longitude: 71°38'01"

Facilities
Affected: Below Elevation 240
500 feet of Harvard Road
gravel pit on left abutment

Geologic
Conditions: Both abutments are poorly graded sand and gravel
outwash. Depth to phyllite bedrock in the founda-
tion is not known, but may be 15 to 25 feet.
There is a leakage problem in both abutments.
Impervious borrow material for dam construction
was not located on site. Waterholding capabilities
appear poor due to outwash sand and gravel on
both abutments.

Engineering
Notes: The recommended location for an emergency spillway
is at the right abutment. The U.S. Army has
built a shallow fish and wildlife pool at this
site. The pond is known as Cranberry Lake and
has a surface area of about 65 acres. Water-
holding capability above the present pool level
appears poor.

Public
Ownership: The entire site is owned by the U.S. Army.

SITE NA-0715

Location: On a tributary to the Still River approximately
2200 feet downstream from Green Road in
Bolton, Massachusetts.
Clinton, Massachusetts Quadrangle.
Latitude: 42° 27' 20" Longitude: 71° 37' 45"

Facilities
Affected No facilities affected below elevation 380.

Geologic
Conditions: Both abutments are poorly graded sand and gravel
and swampy along the stream. Depth to schist
bedrock in the foundation is not known, but may
be 15 to 25 feet. There are leakage problems on
both abutments and in the foundation. Impervious
borrow material for dam construction was not
located on site. Waterholding capabilities
appear poor.

Engineering
Notes: The recommended location for an emergency spillway
is at the right abutment.

Public
Ownership: About 10% of the site is owned by the Town of Bolton.

SITE NA-0716

Location: On a tributary to the Still River approximately
1200 feet upstream from Still River Road in
Bolton, Massachusetts.

Clinton, Massachusetts Quadrangle.

Latitude: 42° 27' 49" Longitude: 71° 37' 52"

Facilities
Affected: No facilities affected below elevation 300.

SITE NA-0716 (Cont'd)

Geologic
Conditions:

The right abutment is a sandy silt and poorly graded sand and gravel outwash. The left abutment is poorly graded sand and gravel outwash with schist bedrock outcropping on the left streambank. Depth to schist bedrock in the foundation is not known, but may be 15 to 25 feet. There are leakage problems in both abutments. Impervious borrow material for dam construction is available on site. Waterholding capabilities appear good, provided a cutoff is made to glacial till or bedrock beneath the sand terrace low on the right abutment.

Engineering
Notes:

The recommended location for an emergency spillway is at the left abutment. The right abutment of the dike is on schist bedrock. The left abutment of the dike is the same as for the dam.

SITE NA-0717

Location:

On a tributary to the Nashua River approximately 2000 feet downstream from Route 2 on Fort Devens Military Reservation in Lancaster, Massachusetts.

Shirley Massachusetts Quadrangle

Latitude: 42°30'49" Longitude: 71°39'05"

Facilities
Affected:

1500 feet of an unnamed road between Union Turnpike and Old Shirley Road.

Geologic
Conditions:

The right abutment is silty sand glacial till. The left abutment is thin, poorly graded fine sand outwash underlain by silty sand glacial till -- shallow to phyllite bedrock. Depth to phyllite bedrock in the foundation is not known, but may be 5 to 10 feet. There is a leakage problem in the foundation. Impervious borrow material for dam construction is available on site.

SITE NA-0717 (Cont'd)

Geologic
Conditions: Waterholding capabilities appear good provided
(cont'd) a cutoff is made to bedrock beneath swamp in
the foundation.

Engineering
Notes: The recommended location for an emergency
spillway is at the right abutment.

Public
Ownership: The entire site is owned by the U.S. Army.

SITE NA-0718

Location: On a tributary to Morse Brook approximately
200 feet upstream from Patterson Road in
Shirley, Massachusetts.

Shirley, Massachusetts Quadrangle.

Latitude: 42°33'19" Longitude: 71°37'52"

Facilities
Affected:

Below elevation 270

6 houses
27 trailers
2 garages
5 barns and sheds
300 feet of Clark Road

Below elevation 260

4 houses
27 trailers
1 garage
3 barns and sheds
300 feet of Clark Road

Below elevation 265

5 houses
27 trailers
2 garages
3 barns and sheds
300 feet of Clark Road

Below elevation 255

1 house
26 trailers

Geologic
Conditions: Both abutments are sand and gravel deposits
(kame terrace). Depth to schist bedrock in the
foundation is not known, but probably is deep.
There are leakage problems in both abutments and
the foundation. Impervious borrow material for
dam construction was not located on site. Water-
holding capabilities appear poor.

Engineering
Notes: The recommended location for an emergency spillway
is at the left abutment.

NA-0719 -- BARE HILL POND

Location: Between Routes 110 and 111 in Harvard,
Massachusetts.

Hudson, Massachusetts Quadrangle

<u>Surface Area</u> (Acres)	<u>Height of Dam</u> (Ft.)	<u>Drainage Area</u>	
		<u>(Acres)</u>	<u>(Sq. Mi.)</u>
350	6	2370	3.7

Potential
for
Expansion:

Expansion appears possible, but large
surface area might cause substantial
evaporation losses.

Remarks:

This is an earth-fill dam. Upstream
face is rock riprapped. There is a 10
foot wide spillway with concrete
sidewalls and ledge floor. Principal
spillway is a 10 foot wide concrete
weir with 2 bays. Structure appears
to be in good condition except for trees
and brush growing on the downstream slope.

NA-0720 -- LONG POND

Location: Upstream of Sandy Pond near the
Groton-Ayer town line in Ayer,
Massachusetts.

Ayer, Massachusetts Quadrangle

<u>Surface Area</u> (Acres)	<u>Height of Dam</u> (Ft.)	<u>Drainage Area</u>	
		<u>(Acres)</u>	<u>(Sq. Mi.)</u>
60	8	590	0.92

Potential
for
Expansion:

Expansion appears possible. Small drainage
area will limit extensive expansion.

Remarks:

The pond is very shallow at the dam.
Structure is an old mill dam with vertical
downstream face of granite blocks. Spillway
is a 10 foot weir. There are trees growing
on the dam and there is leakage visible
downstream.

NA-0721 -- SANDY POND

Location: Upstream of Snake Hill Road in Ayer, Massachusetts.

Ayer, Massachusetts Quadrangle.

Remarks: Snake Hill Road separates Sandy Pond from Flanagan Pond. (NA-0722). Both ponds are at the same elevation. Water level is controlled by the Flanagan Pond outlet.

Notes

NA-0722 -- FLANAGAN POND

Location: Upstream of Central Avenue in Ayer,
Massachusetts.

Ayer, Massachusetts Quadrangle

<u>Surface Area</u> <u>(Acres)</u>	<u>Height of Dam</u> <u>(Ft.)</u>	<u>Drainage Area</u> <u>(Acres)</u>	<u>Area</u> <u>(Sq. Mi.)</u>
155	8	2370	3.7

Potential
for
Expansion:

Limited by roads, railroad, houses, and
cottages. See Site NA-0711 which appears
to have expansion potential.

Remarks:

Sandy Pond and Flanagan Pond are separated
by a causeway (Snake Hill Road). Sandy
Pond flows into Flanagan Pond through a
culvert. Flanagan Pond flows under the
railroad into Balch Pond. The water
control structure for all the ponds is
just south of East Main Street. The
spillway is a granite-block weir about
20 feet wide with a 10 foot drop.

NA-0723 -- GROVE POND

Location: Between the Boston and Maine Railroad and
Barnum Street in Ayer, Massachusetts.

Ayer, Massachusetts Quadrangle.

Remarks: Grove Pond is just upstream of NA-0724, Plow
Shop Pond. The dam and spillway at Plow Shop
Pond controls the water level in both ponds.

Notes

NA-0724 -- PLOW SHOP POND

Location: Between two branches of the Boston
and Maine Railroad in Ayer, Massachusetts.

Ayer, Massachusetts Quadrangle.

<u>Surface Area</u> <u>(Acres)</u>	<u>Height of</u> <u>Dam (Ft.)</u>	<u>Drainage</u> <u>(Acres)</u>	<u>Area</u> <u>(Sq. Mi.)</u>
114	6	11,900	18.6

Potential
for
Expansion:

Expansion does not appear practical. Both
abutments are pervious outwash sand and
gravel. The shoreline is developed and
inundated facilities would be extensive.

Remarks:

The spillway, a concrete weir about 50
feet long, controls the water level in
Plow Shop Pond and Grove Pond (NA-0723).
Spillway is in fair condition, sidewalls
are cracked.



SUMMARY DATA FOR POTENTIAL UPSTREAM RESERVOIR SITES

STUDY AREA-NASHUA RIVER										SUBWATERSHED-NASHUA RIVER									
BENEFICIAL POOL										EMERGENCY SPILLWAY									
ELEV	STORAGE	PER AC FT	AREA	COST/ SURF AC	DEPTH AT DAM	CREST ELEV	STORAGE AT CREST	DESIGN ELEV	AREA	DESIGN ELEV	AREA	DESIGN ELEV	AREA	DESIGN ELEV	AREA	DESIGN ELEV	AREA	DESIGN ELEV	AREA
(MSL)	AC FT	IN	(AC)	(\$)	(FT)	(MSL)	AC FT	IN	(\$)	(MSL)	AC FT	IN	(\$)	(MSL)	AC FT	IN	(\$)	(MSL)	AC FT
NA-0701										NA-0702									
DA= 0.73 SQ MI = 467 AC										DA= 0.95 SQ MI = 608 AC									
USGS QUAD- CLINTON MASS										USGS QUAD- CLINTON MA-HUDSON MA									
LATITUDE 42-26-46										LATITUDE 42-28-23									
LONGITUDE 71-38-12										LONGITUDE 71-37-30									
PEAK FLOW = 223 CFS										PEAK FLOW = 290 CFS									
SITE RATING (3)										SITE RATING (3)									
347.2	0	0.0	3	3.3	362.9	E	162	4.1	2530	365.2	17	367.9	24	9	*****				
359.2	100	2.5	4990	14	35880	15.2	361.7	E	143	3.6	3490	16	365.6	22	6	0.18			
369.9	275	7.1	2080	18	31240	25.9	372.4	E	331	8.5	1730	24	376.2	32	27	0.34			
380.6	537	13.7	1690	31	29660	36.5	383.1	E	624	16.0	1450	39	387.7	44	118	0.48			
389.7	886	22.7	1410	46	26830	45.8	392.2	E	1013	26.0	1230	53	397.4	53	268	0.59			
391.6	973	25.0	1350	49	26900	47.5	394.1	E	1105	28.4	1190	55	399.1	55	302	0.61			
NA-0702										NA-0703									
DA= 0.96 SQ MI = 614 AC										DA= 0.96 SQ MI = 614 AC									
USGS QUAD- HUDSON MASS										USGS QUAD- HUDSON MASS									
LATITUDE 42-28-28										LATITUDE 42-28-28									
LONGITUDE 71-36-09										LONGITUDE 71-36-09									
PEAK FLOW = 293 CFS										PEAK FLOW = 293 CFS									
SITE RATING (2)										SITE RATING (2)									
371.0	0	0.0	8	1.0	377.2	E	212	4.1	2990	379.5	77	383.2	13	20	*****				
375.1	100	2.0	6620	41	16190	5.1	377.6	E	234	4.6	2830	80	382.5	12	19	0.21			
379.2	336	6.6	2250	74	10200	9.2	381.7	E	548	10.7	1380	99	386.9	17	28	0.43			
383.2	690	13.5	1240	98	8740	13.2	385.7	E	958	18.7	890	117	390.1	20	41	0.62			
387.6	1162	22.7	840	121	8090	17.6	390.1	E	1486	29.0	660	136	393.7	24	58	0.77			
388.5	1280	25.0	780	126	7950	18.5	391.0	E	1620	31.5	620	140	394.5	25	63	0.80			

NOTES - (1) COSTS ARE BASED ON 1971 S.C.S. DESIGN CRITERIA AND COST DATA.

(2) EMERGENCY SPILLWAY STORAGE AND COSTS ARE BASED ON TOTAL STORAGE, INCLUDING BENEFICIAL POOL.

(3) EMERGENCY SPILLWAY TYPE CODE- C=CONCRETE CHUTE, D=CONCRETE DROP, E=EXCAVATED, T= TWO SPILLWAYS, N= NONE

(4) TABULAR DATA ARE BASED ON PRELIMINARY INFORMATION. FIGURES SHOWN ARE PRIMARILY FOR COMPARISON PURPOSES.

(5) ELEVATIONS ARE SHOWN TO THE NEAREST 0.1 FOOT TO SHOW VARIATION BETWEEN DEVELOPMENTS-ONLY, AND ARE NOT TO BE CONSIDERED ACCURATE TO THAT DEGREE.

** DO NOT USE FOR FINAL SITE SELECTION OR LAND ACQUISITION. **

SUMMARY DATA FOR POTENTIAL UPSTREAM RESERVOIR SITES

STUDY AREA-NASHUA RIVER														
SUBWATERSHED-NASHUA RIVER														
BENEFICIAL POOL														

SUMMARY DATA FOR POTENTIAL UPSTREAM RESERVOIR SITES

STUDY AREA-NASHUA RIVER

SUBWATERSHED-NASHUA RIVER

BENEFICIAL POOL

EMERGENCY SPILLWAY

DESIGN

DAM

SAFE

YIELD

 COST PER AC FT (\$)
 STORAGE IN AC FT (\$)
 COST/DEPTH AT (\$)
 SURF AC (\$)
 AREA (AC)
 ELEV (MSL)
 CREST ELEV (MSL)
 STORAGE AT CREST AC FT (\$)
 COST PER AC FT (\$)
 TOP ELEV (MSL)
 HGT VOL (CY)
 PERCENT CHANGE
 AT 95

NA-0712
 SITE RATING (3) DA= 1.07 SQ MI = 685 AC USGS QUAD- AYER MASS
 STREAM WATER QUALITY (B) 100-YR PRIN SPWY DESIGN STORM RUNOFF = 8.20 IN. PEAK FLOW = 327 CFS

SITE RATING (3)	0	0.0	4	6.5	240.2	E	237	4.1	3320	242.7	49	246.0	22	43	*****
230.5	0	0.0	4	6.5	240.2	E	237	4.1	3320	242.7	49	246.0	22	43	*****
236.6	100	1.7	7830	12.6	239.1	E	193	3.4	4050	241.5	46	243.6	20	33	0.21
242.0	309	5.4	2950	18.0	244.5	E	441	7.6	2070	246.8	59	249.2	25	60	0.43
246.0	517	9.1	2000	22.0	248.5	E	678	11.8	1530	250.7	70	253.3	29	86	0.58
250.8	830	14.6	1470	26.9	253.3	E	1024	17.9	1190	255.7	86	258.9	35	129	0.72
252.5	943	16.5	1330	28.5	255.0	E	1152	20.2	1090	256.9	91	259.7	36	136	0.75

NA-0714
 SITE RATING (3) DA= 1.77 SQ MI = 1133 AC USGS QUAD- CLINTON MASS
 STREAM WATER QUALITY (B) 100-YR PRIN SPWY DESIGN STORM RUNOFF = 8.20 IN. PEAK FLOW = 541 CFS

SITE RATING (3)	0	0.0	11	2.4	228.2	E	392	4.1	650	230.7	109	233.8	16	10	*****
220.3	0	0.0	11	2.4	228.2	E	392	4.1	650	230.7	109	233.8	16	10	*****
224.0	100	1.1	2530	6.0	226.5	E	254	2.7	1000	229.0	90	231.0	13	6	0.27
227.6	318	3.4	1170	9.6	230.1	E	553	5.9	680	232.5	132	234.8	17	11	0.55
230.1	537	5.6	910	12.1	232.6	E	848	9.0	580	235.0	165	238.3	20	15	0.73
232.5	820	8.7	680	14.5	235.0	E	1207	12.8	460	236.7	187	239.7	22	17	0.94

NA-0715
 SITE RATING (3) DA= 0.56 SQ MI = 358 AC USGS QUAD- CLINTON MASS
 STREAM WATER QUALITY (B) 100-YR PRIN SPWY DESIGN STORM RUNOFF = 8.20 IN. PEAK FLOW = 171 CFS

SITE RATING (3)	0	0.0	2	3.2	371.0	E	124	4.1	6480	373.4	25	376.5	18	21	*****
361.2	0	0.0	2	3.2	371.0	E	124	4.1	6480	373.4	25	376.5	18	21	*****
370.2	100	3.3	8590	12.2	372.7	E	161	5.4	5350	375.0	28	377.1	19	23	0.17
371.2	123	4.1	7080	13.2	373.7	E	187	6.3	4670	376.0	29	378.1	20	26	0.20
372.2	147	4.9	6100	14.2	374.7	E	214	7.1	4180	377.2	31	379.6	22	32	0.21
372.5	152	5.1	5900	14.5	375.0	E	221	7.3	4060	377.4	31	379.7	22	33	0.21

 NOTES - (1) COSTS ARE BASED ON 1971 S.C.S. DESIGN CRITERIA AND COST DATA.
 (2) EMERGENCY SPILLWAY STORAGE AND COSTS ARE BASED ON TOTAL STORAGE, INCLUDING BENEFICIAL POOL.
 (3) EMERGENCY SPILLWAY TYPE CODE- C=CONCRETE CHUTE, D=CONCRETE DROP, E=EXCAVATED, T= TWO SPILLWAYS, N= NONE
 (4) TABULAR DATA ARE BASED ON PRELIMINARY INFORMATION. FIGURES SHOWN ARE PRIMARILY FOR COMPARISON PURPOSES.
 (5) ELEVATIONS ARE SHOWN TO THE NEAREST 0.1 FOOT TO SHOW VARIATION BETWEEN DEVELOPMENTS ONLY, AND ARE NOT TO BE CONSIDERED ACCURATE TO THAT DEGREE.

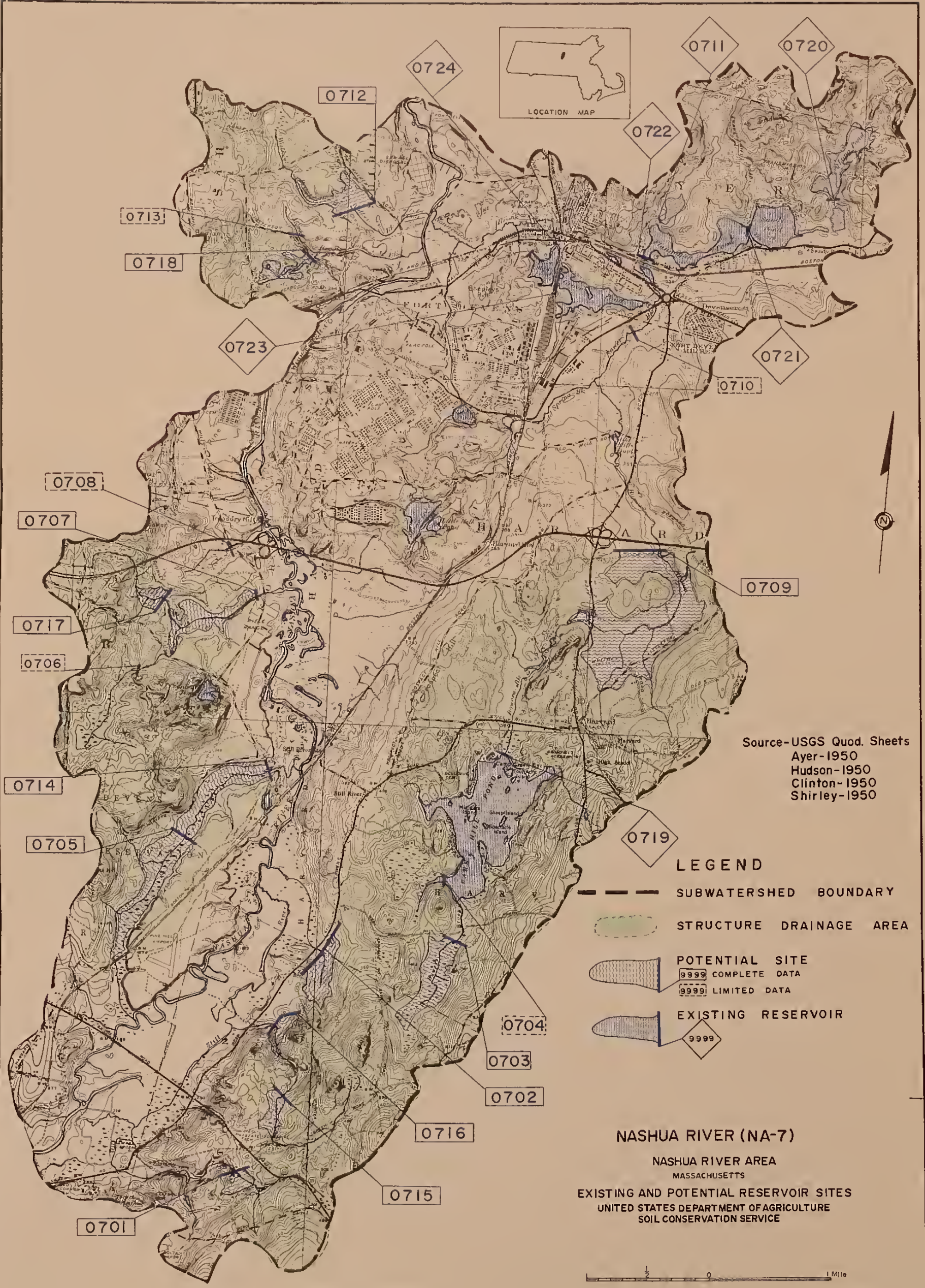
 ** DO NOT USE FOR FINAL SITE SELECTION OR LAND ACQUISITION. **

SUMMARY DATA FOR POTENTIAL UPSTREAM RESERVOIR SITES

STUDY AREA-NASHUA RIVER										SUBWATERSHED-NASHUA RIVER									
BENEFICIAL POOL										EMERGENCY SPILLWAY									
COST										DESIGN									
PER										HIGH WATER									
AREA										DAM									
SURF										DAM									
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Notes



NASHUA STUDY AREA
SITE DATA FOR

Subwatershed NA-8, Catacoonamug Brook

The Catacoonamug Brook Subwatershed covers about 13,400 acres in Lancaster, Leominster, and Lunenburg, in Worcester County and Shirley, in Middlesex County.

Catacoonamug Brook is the major stream in the subwatershed, originating in Lunenburg and flowing southeasterly through Shirley to its confluence with the Nashua River. Elevations range from a high of about 680 feet on Clarks' Hill to about 250 feet in Shirley. Geology in the Catacoonamug Brook subwatershed is predominantly characterized by schist bedrock at depths of 15 to 60 feet overlain by glacial till, englacial drift or outwash sand and gravel.

Twenty potential reservoir sites and four existing reservoirs were studied. Design summaries are included for 11 potential sites that met study criteria.

SITE NA-0801

Location: On a tributary to Catacoonamug Brook approximately 3,200 feet upstream from Page Street in Lunenburg, Massachusetts.

Shirley, Massachusetts Quadrangle

Latitude: 42°35'25" Longitude: 71°42'22"

Facilities Affected: This site was eliminated from further study because of low storage potential and high cost to relocate affected facilities.

Geologic Conditions: Both abutments are silty sand (glacial till) at higher elevations and sand and gravel terrace at lower elevations. There is a schist outcrop high on the left abutment. Depth to bedrock in the foundation is not known. There are leakage problems in both abutments and the foundation. Impervious borrow material for dam construction is available on site; however, rock greater than 6 inches may run 25 per cent. Water-holding capabilities appear fair to good.

SITE NA-0801 (cont'd)

Engineering
Notes:

The recommended location for an emergency spillway is at the right abutment. Water-holding capabilities appear fair to good depending upon whether a cut-off is made through the swamp deposits in the foundation and sand and gravel terraces on both abutments.

SITE NA-0802

Location:

On a tributary to Catacoonamug Brook approximately 1,350 feet down stream from Page Street in Lunenburg, Massachusetts.

Shirley, Massachusetts Quadrangle

Latitude: $42^{\circ}34'46''$ Longitude: $71^{\circ}42'11''$

Facilities
Affected:

This site was eliminated from further study because of low storage potential, high cost of affected facilities, and poor water holding capability.

Geologic
Conditions:

The right abutment is glacial outwash with swamp at the lower elevations. The left abutment is englacial drift at higher elevations and poorly graded outwash sand and gravel at lower elevations- shallow to bedrock. Depth to schist bedrock in the foundation is not known but may be 50 to 60 feet. There are leakage problems in both abutments and the foundation. Impervious borrow material for dam construction was not located on site. Water-holding capabilities appear poor.

Engineering
Notes:

The recommended location for an emergency spillway is at the left abutment. Water-holding capabilities appear poor due to the outwash plain on the right abutment. Abutments for dikes consist of englacial drift.

SITE NA-0803

Location: On Catacoonamug Brook approximately 1500 feet upstream from Lancaster Avenue in Lunenburg, Massachusetts.

Shirley Massachusetts Quadrangle

Latitude: $42^{\circ}34'21''$ Longitude: $71^{\circ}43'10''$

Facilities
Affected: No facilities affected below elevation 410 feet.

Geologic
Conditions: Both abutments are silty sand glacial till with poorly graded sand terrace and swamps at lower elevations. Depth to schist bedrock in the foundation is not known but may be 45 to 55 feet. There are leakage problems in the foundation and low on both abutments. Impervious borrow material for dam construction is available on site. Waterholding capabilities appear to be fair to good depending upon whether or not positive cutoff is made beneath the sand terraces and swamp.

Engineering
Notes: The recommended location for an emergency spillway is at the right abutment.

SITE NA-0804

Location: At outlet end of marsh draining into Massapoag Pond approximately 3000 feet upstream of Massapoag Pond in Lunenburg, Massachusetts.

Shirley Massachusetts Quadrangle

Latitude: $42^{\circ}33'51''$ Longitude: $71^{\circ}43'34''$

Remarks: This site did not meet criteria for this study due to the small contributing drainage area, (213 acres). Therefore, no further investigations were made.

SITE NA-0805

Location: On a tributary to Massapoag Pond approximately
200 feet upstream from Lincoln Street in
Leominster, Massachusetts.

Shirley, Massachusetts Quadrangle

Latitude: $42^{\circ}33'42''$ Longitude: $71^{\circ}44'11''$

Facilities

Affected:

Below Elevation 460

Below Elevation 455

41 houses	31 houses
3 sheds	2 sheds
2 garages	1 garage
780 feet of North Street	590 feet of North Street
450 feet of Lincoln Street	

Geologic

Conditions:

The left abutment is silty sand (glacial till). The right abutment is poorly graded sand and gravel outwash. Depth to schist bedrock in the foundation is not known but may be 15 to 25 feet. There is a leakage problem on the right abutment. Impervious borrow material for dam construction is available on site; however, rock greater than 6 inches may run 30 percent. Waterholding capabilities appear fair to poor due to outwash on the right abutment.

Engineering

Notes:

The recommended location for an emergency spillway is at the left abutment.

Public

Ownership:

About 5% of the site is owned by the Town of Leominster.

SITE NA-0806 -- MASSAPOAG POND

Location: Upstream of Lancaster Avenue in Lunenburg,
Massachusetts.

Shirley, Massachusetts Quadrangle

<u>Surface Area</u> <u>(Acres)</u>	<u>Height of Dam</u> <u>(Ft.)</u>	<u>Drainage Area</u> <u>(Acres)</u>	<u>(Sq. Mi.)</u>
55	8	1600	2.49

Potential
for
Expansion:

Appears to have fair potential-Surface
area could be more than doubled with
little effect on facilities.

Remarks:

This is an earth dam. Spillway structure
has been removed. Flows pass through
the breach on left abutment. Dam has
many trees growing on the fill.

Geologic
Conditions:

Both abutments are silty sand glacial till.
There is swamp low on the right abutment and
poorly graded sand and gravel low on the toe
of the right abutment. Depth to schist
bedrock in the foundation is not known, but
may be 15 to 25 feet. There is a leakage
problem on the right of the foundation.
Impervious borrow material for dam construction
is available on site; however, rock greater
than 6 inches may run 30 percent. Waterholding
capabilities appear to be good provided a
cutoff is made to glacial till beneath the
swamp low on the right abutment.

Engineering
Notes:

The recommended location for an emergency
spillway is at the right abutment.

SITE NA-0807

Location: On a tributary to Catacoonamug Brook
approximately 350 feet upstream from
Goodrich Street in Lunenburg, Massachusetts.

Shirley Massachusetts Quadrangle

Latitude: $42^{\circ}33'33''$ Longitude: $71^{\circ}42'39''$

Facilities
Affected:

Below Elevation 370

725 feet of Lancaster Avenue

Below Elevation 365

590 feet of Lancaster Avenue

Below Elevation 360

400 feet of Lancaster Avenue

Geologic
Conditions:

Both abutments are silty (glacial till) with stream terrace deposits and swamp at low elevations. Depth to schist bedrock in the foundation is not known, but may be 20 to 30 feet. There are leakage problems low on both abutments and in the foundation. Impervious borrow material for dam construction is available on site; however, rock greater than 6 inches may run 30 percent. Waterholding capabilities appear fair to good depending upon whether a cutoff is made to glacial till beneath the stream terrace and the swamp low on the abutments and in the foundation.

Engineering
Notes:

The recommended location for an emergency spillway is at the right abutment.

SITE NA-0808

Location: On Catacoonamug Brook approximately
600 feet downstream from Reservoir Road
in Lunenburg, Massachusetts.

Shirley, Massachusetts Quadrangle

Latitude: $42^{\circ}34'02''$ Longitude: $71^{\circ}41'50''$

Facilities
Affected:

Below Elevation 340
1550 feet of Lancaster Avenue
4200 feet of Reservoir Road

Below Elevation 330
1200 feet of Lancaster Avenue
4200 feet of Reservoir Road

Geologic
Conditions:

Both abutments are outwash sand and gravel. Depth to bedrock in the foundation is not known. There are leakage problems in both abutments and the foundation. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear poor. Foundations of dikes are good, although the abutments probably will leak.

Engineering
Notes:

The recommended location for an emergency spillway is at the left abutment.

SITE NA-0809

Location:

At outlet end of a long swamp
approximately 1,100 feet upstream
from Catacoonamug Road in
Shirley, Massachusetts.

Shirley, Massachusetts Quadrangle

Latitude: $42^{\circ}33'26''$ Longitude: $71^{\circ}40'24''$

Remarks:

This site did not meet criteria for
this study due to the small contributing
drainage area, (125 acres). Therefore,
no further investigations were made.

SITE NA-0810

Location: On Spruce Swamp Brook approximately 3,500 feet upstream from Boston and Maine Railroad in Shirley, Massachusetts.

Shirley, Massachusetts Quadrangle

Latitude: 42°33'18" Longitude: 71°39'56"

Facilities Affected: Below Elevation 330

- 1 house
- 1 barn
- 300 feet of Holden Road

Geologic Conditions: The left abutment is outwash sand and gravel with schist outcrops high on the left abutment. The right abutment is outwash sand and gravel. Depth to schist bedrock is not known but may be 15 to 20 feet. There are leakage problems in both abutments and in the foundation. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear poor; however, schist bedrock on the left abutment may be relatively shallow and although no outcrops were observed in the right abutment, there is a possibility of bedrock.

Engineering Notes: The recommended location for an emergency spillway is at the right abutment.

SITE NA-0811

Location: On Easter Brook approximately 800 feet upstream from Gibson Street in Lunenburg, Massachusetts.

Shirley, Massachusetts Quadrangle

Latitude: 42°32'43" Longitude: 71°42'56"

Remarks: This site did not meet criteria for this study due to the small contributing drainage area, (269 acres). Therefore, no further investigations were made.

Location: On Easter Brook approximately 400 feet
upstream from Goodrich Street in
Lunenburg, Massachusetts.

Shirley, Massachusetts Quadrangle

Latitude: $42^{\circ}33'04''$ Longitude: $71^{\circ}42'00''$

Facilities

Affected:

Below Elevation 360
2900 feet of pipeline
2 houses

Below Elevation 345
2500 feet of pipeline
1 house

Below Elevation 350
2900 feet of pipeline
1 house

Below Elevation 330
1200 feet of pipeline

Geologic

Conditions:

The right abutment is outwash sand and gravel.
The left abutment is glacial till. Depth
to bedrock in the foundation is not known.
There are leakage problems in the right abutment.

Engineering

Notes:

The recommended location for an emergency
spillway is at the left abutment.

SITE NA-0813

Location: At outlet end of marsh draining into Oak
Hill Pond. Approximately 400 feet upstream
of pond in Lancaster, Massachusetts.

Shirley, Massachusetts Quadrangle

Latitude: $42^{\circ}30'19''$ Longitude: $71^{\circ}40'26''$

SITE NA-0813 (Cont'd)

Remarks: This site did not meet criteria for this study due to the small contributing drainage area, (179 acres). Therefore, no further investigations were made.

SITE NA-0815

Location: On McGovern Brook approximately 7,000 feet upstream from the North Nashua River in Lancaster, Massachusetts.

Shirley, Massachusetts Quadrangle

Latitude: 42°30'54" Longitude: 71°41'58"

Facilities
Affected: No facilities affected below elevation 390.

Geologic
Conditions: The right abutment is outwash sand and gravel and the left abutment is glacial till. Depth to schist bedrock in the foundation is not known but may be 15 to 25 feet. There are leakage problems in the right abutment and possibly in the foundation. Impervious borrow material for dam construction is available on site. Waterholding capabilities appear to be poor.

Engineering
Notes: The recommended location for an emergency spillway is at the left abutment.

SITE NA-0816

Location: On Bow Brook near the intersection of Shirley, Lancaster, and Lunenburg Boundaries in Shirley, Massachusetts.

Shirley, Massachusetts Quadrangle

Latitude: 42°31'51" Longitude: 71°40'34"

SITE NA-0816 (Cont'd)

Facilities
Affected:

Below Elevation 350

21 houses
375 feet of gravel road

Below Elevation 345

6 houses
375 feet of gravel road

Below Elevation 340

2 houses
250 feet of gravel road

Geologic
Conditions:

The right abutment is ice contact sand and gravel outwash. The left abutment is outwash sand and gravel and kame terrace. Depth to bedrock in the foundation is not known. There are leakage problems in both abutments and possibly in the foundation. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear poor.

Engineering
Notes:

Recommended location for an emergency spillway is at the right abutment.

SITE NA-0817

Location:

On a tributary to Bow Brook approximately 1,900 feet downstream from Lancaster Road in Shirley, Massachusetts.

Shirley, Massachusetts Quadrangle

Latitude: 42°31'50" Longitude: 71°40'20"

Remarks:

This site did not meet criteria for this study due to the small contributing drainage area, (275 acres). Therefore no further investigations were made.

SITE NA-0818

Location: On Spectacle Brook approximately 600 feet upstream from Lunenburg Road in Lancaster, Massachusetts on Fort Devens Military Reservation.

Clinton, Massachusetts Quadrangle

Latitude: $42^{\circ}29'39''$ Longitude: $71^{\circ}41'06''$

Facilities Affected: 3,000 feet of an un-named road.

Geologic Conditions: Both abutments are poorly graded sand and gravel outwash with swamp at low elevations. Depth to phyllite bedrock in the foundation is not known but may be 25 to 30 feet. There are leakage problems in both abutments and in the foundation. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear poor due to outwash sand and gravel on both abutments.

Engineering Notes: The recommended location for an emergency spillway is at the left abutment.

Public Ownership: The entire site is owned by the U.S. Army.

SITE NA-0819

Location: On Catacoonamug Brook approximately 400 feet upstream from Flat Hill Road in Lunenburg, Massachusetts.

Shirley, Massachusetts Quadrangle

Latitude: $42^{\circ}33'59''$ Longitude: $71^{\circ}41'32''$

Facilities Affected:

<u>Below Elevation 340</u>	<u>Below Elevation 330</u>
1 house	Sportsman's Club
1550 feet of Lancaster Avenue	1200 feet of Lancaster Ave.
1850 feet of Flat Hill Road	1850 feet of Flat Hill Road
4150 feet of Reservoir Road	4150 feet of Reservoir Road
Sportsman's Club	

SITE NA-0819 (cont'd)

Geologic
Conditions:

The left abutment is sand and gravel
esker deposits. The right abutment
is outwash sand and gravel. Depth to
bedrock in the foundation is not known.
There are leakage problems in both abutments
and the foundation. Impervious borrow
material for dam construction was not
located on site. Water-holding capabilities
appear poor.

Engineering
Notes:

The recommended location for an emergency
spillway is at the left abutment.

Public
Ownership:

About 5 % of the site is owned by the
Town of Lunenburg.

SITE NA-0820 -- LAKE SHIRLEY

Location: On the Worcester County-Middlesex County
line in Lunenburg, Massachusetts.

Shirley, Massachusetts Quadrangle.

<u>Surface Area</u> <u>(Acres)</u>	<u>Height of</u> <u>Dam (Ft.)</u>	<u>Drainage Area</u>	
		<u>(Acres)</u>	<u>(Sq. Mi.)</u>
354	25	9200	14.37

Potential
for
Expansion:

Further expansion would affect a
large number of cottages and the
Boston and Maine Railroad.

Remarks:

This is an earth-fill dam with a
concrete retaining wall at the
upstream slope. Spillway is a
25 foot weir with a stepchute
outlet of granite block construction.
Overall conditions of the structure
is good.

SITE NA-0821 -- FORT POND

Location: On Bow Brook, downstream of Lunenburg Road in Lancaster, Massachusetts.

Shirley, Massachusetts Quadrangle.

<u>Surface Area</u> <u>(Acres)</u>	<u>Height of</u> <u>Dam (Ft.)</u>	<u>Drainage Area</u>	
		<u>(Acres)</u>	<u>(Sq. Mi.)</u>
74	6	510	0.80

Potential
for
Expansion:

Limited by numerous cottages located around the pond.

Remarks:

The spillway is a 4 foot wide, 4 foot deep concrete weir. The structure is in poor conditions. Spillway concrete has many cracks.

SITE NA-0822

Location: On a tributary to Catacoonamug Brook
approximately 100 feet upstream from
West Street in Lunenburg, Massachusetts.

Shirley, Massachusetts Quadrangle

Latitude: $42^{\circ}35'24''$ Longitude: $71^{\circ}44'06''$

Facilities

Affected:	<u>Below Elevation 500</u> 21 houses	<u>Below Elevation 480</u> 4 houses
	<u>Below Elevation 490</u> 13 houses	<u>Below Elevation 470</u> 2 houses

Geologic
Conditions:

Both abutments are glacial till with about 20 percent boulders. Depth to schist bedrock in the foundation is not known, but may be 15 to 25 feet. There is a leakage problem in the foundation. Impervious borrow material for dam construction is available on site; however, rock greater than 6-inches may run to 20 percent. Waterholding capabilities appear good if a positive cutoff can be made to glacial till in the foundation.

Engineering
Notes:

The recommended location for an emergency spillway is at the right abutment.

SITE NA-0823 -- LAKE WHALOM

Location: Near Prospect Street in Lunenburg,
Massachusetts.

Shirley, Massachusetts Quadrangle.

<u>Surface Area</u> <u>(Acres)</u>	<u>Height of</u> <u>Dam (Ft.)</u>	<u>Drainage</u> <u>(Acres)</u>	<u>Area</u> <u>(Sq. Mi.)</u>
94	5	450	0.7

Potential
for
Expansion:

Limited by cottages, amusement park, and
small drainage area.

Remarks:

This is a low earth dam with a 3 foot wide
open spillway and an auxiliary chute spill-
way. There are trees growing on the fill
and the concrete spillways are cracked in
many places. Overall condition of the
structure is poor.



SITE NA-0824 Spectacle Pond

Location: On Spectacle Brook between Shirley Road
 and Lunenburg Road in Lancaster, Massachusetts.

Shirley, Massachusetts Quadrangle

Remarks: Spectacle Pond appears to be a natural
 depression with no dam. Control is a
 stone structure with a culvert under
 road. No photos were taken.

SUMMARY DATA FOR POTENTIAL UPSTREAM RESERVOIR SITES

STUDY AREA-NASHUA RIVER														
SUBWATERSHED-CATACONAMUG BROOK														
BENEFICIAL POOL														

SUMMARY DATA FOR POTENTIAL UPSTREAM RESERVOIR SITES

STUDY AREA-NASHUA RIVER										SUBWATERSHED-CATACOOMMUG BROOK									
BENEFICIAL POOL										EMERGENCY SPILLWAY									

SUMMARY DATA FOR POTENTIAL UPSTREAM RESERVOIR SITES

[illegible]

NOTES - (1) COSTS ARE BASED ON 1971 S.C.S. DESIGN CRITERIA AND COST DATA.

- (2) EMERGENCY SPILLWAY STORAGE AND COSTS ARE BASED ON TOTAL STORAGE, INCLUDING BENEFICIAL POOL.
- (3) EMERGENCY SPILLWAY TYPE CODE- C=CONCRETE CHUTE, D=CONCRETE DROP, E=EXCAVATED, T= TWO SPILLWAYS, N= NONE
- (4) TABULAR DATA ARE BASED ON PRELIMINARY INFORMATION. FIGURES SHOWN ARE PRIMARILY FOR COMPARISON PURPOSES.
- (5) ELEVATIONS ARE SHOWN TO THE NEAREST 0.1 FOOT TO SHOW VARIATION BETWEEN DEVELOPMENTS ONLY, AND ARE NOT TO BE CONSIDERED ACCURATE TO THAT DEGREE.

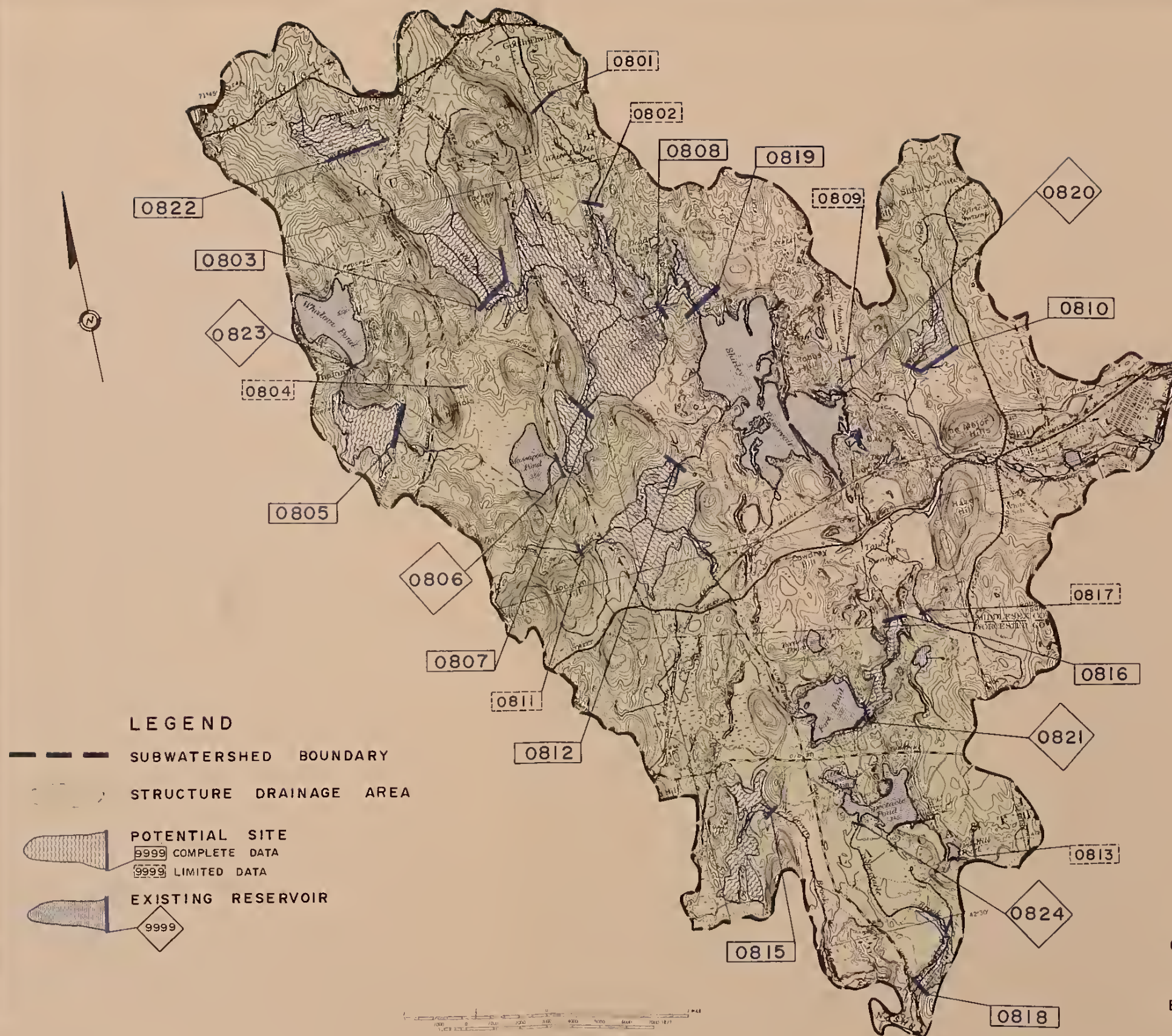
*** DO NOT USE FOR FINAL SITE SELECTION OR LAND ACQUISITION. ***

SUMMARY DATA FOR POTENTIAL UPSTREAM RESERVOIR SITES

STUDY AREA-NASHUA RIVER									
SUBWATERSHED-CATACOOMAMUG BROOK									
BENEFICIAL POOL									

-230-

Notes



LEGEND

--- SUBWATERSHED BOUNDARY

STRUCTURE DRAINAGE AREA

POTENTIAL SITE

9999 COMPLETE DATA

9999 LIMITED DATA

EXISTING RESERVOIR

9999

SOURCE - USGS QUAD. SHEETS
SHIRLEY - 1950
FITCHBURG - 1954
CLINTON - 1950

CATACCOONAMUG BROOK (NA-8)
NASHUA STUDY AREA
MASSACHUSETTS

EXISTING AND POTENTIAL RESERVOIR SITES
UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

NASHUA STUDY AREA
SITE DATA FOR

Subwatershed NA-9, Mulpus Brook

The Mulpus Brook Subwatershed covers about 10,300 acres in Lunenburg, Worcester County, and Shirley and Townsend, in Middlesex County.

The main stream in this subwatershed is Mulpus Brook, originating in Lunenburg, above Hickory Hills Lake and flowing southeasterly through Shirley to its confluence with the Nashua river. Elevations range from a high of about 740 feet in Lunenburg to about 260 feet on the Nashua River flood plain. Geology within the Mulpus Brook subwatershed is characterized by schist bedrock at depths of 10 to 25 feet, overlain by glacial till or englacial drift.

Eight potential reservoir sites and one existing reservoir were studied. Design summaries are included for seven potential sites.

SITE NA-0901

Location:

On Mulpus Brook approximately 1,400 feet upstream from Cross Street in Lunenburg, Massachusetts.

Shirley, Massachusetts Quadrangle

Latitude: 42°35'57" Longitude: 71°40'53"

Facilities

Affected:

Below Elevation 370

2 houses
2350 feet of Mulpus Road
2750 feet of Route 2A
1000 feet of Elmwood Street

Below Elevation 365

2 houses
1200 feet of Mulpus Road
2450 feet of Route 2A
800 feet of Elmwood Street

Below Elevation 360

2 houses
300 feet of Mulpus Road
2000 feet of Route 2A
700 feet of Elmwood Street

SITE NA-0901 (cont'd)

Geologic

Conditions:

The right abutment is thin englacial drift shallow to bedrock with schist outcrops at higher elevations. The left abutment is thin englacial drift with numerous outcrops at all elevations. Depth to schist bedrock in the foundation is not known, but may be 5 to 10 feet. There is a leakage problem on the right side of the foundation. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear fair to good depending upon whether a cutoff is made beneath the sand terrace.

Engineering

Notes:

The recommended location for an excavated emergency spillway is at the left abutment. Preliminary structure designs indicate that a concrete chute emergency spillway may be needed to avoid excessive velocity in an excavated emergency spillway.

Public

Ownership:

About 90% of the site is owned by the Town of Lunenburg.

SITE NA-0902

Location:

On a tributary to Mulpus Brook approximately 5,500 feet upstream from Valley Island Road in Lunenburg, Massachusetts.

Shirley, Massachusetts Quadrangle

Latitude: 42°37'20" Longitude: 71°43'57"

Facilities

Affected:

No facilities affected below elevation 445.

SITE NA-0902 (Cont'd)

Geologic
Conditions:

The right abutment is thin englacial drift, shallow to bedrock. The left abutment is thin englacial drift with granite outcropping at higher elevations. Depth to granitic bedrock in the foundation is not known, but may be 10 to 20 feet. There is a leakage problem in the foundation. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear good if a positive cutoff is made to bedrock in the foundation and left abutment.

Engineering
Notes:

The recommended location for an emergency spillway is at the left abutment.

SITE NA-0903

Location:

On tributary to Mulpus Brook approximately 1600 feet upstream from Northfield Road in Lunenburg, Massachusetts.

Shirley Massachusetts Quadrangle

Latitude: $42^{\circ}36'23''$ Longitude: $71^{\circ}43'42''$

Remarks:

This site did not meet criteria for this study due to the small contributing drainage area, (230 acres). Therefore, no further investigations were made.

SITE NA-0904

Location:

On Beaver Brook at Little Turnpike in Shirley, Massachusetts.

Shirley Massachusetts Quadrangle

Latitude: $42^{\circ}34'59''$ Longitude: $71^{\circ}40'01''$

SITE NA-0904 (cont'd)

Facilities

Affected:

Below Elevation 330
1 house
2200 feet of Barrage and Whitney Streets

Geologic

Conditions:

Both abutments are outwash sand and gravel probably shallow to schist bedrock. Depth to schist bedrock in the foundation is not known, but may be 10 to 15 feet. There are leakage problems in both abutments. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear to be fair to good depending upon whether a cutoff is made to bedrock on both abutments.

Engineering

Notes:

The recommended location for an emergency spillway is at the right abutment.

SITE NA-0905

Location:

On Mulpus Brook approximately 750 feet upstream from Townsend Road in Shirley, Massachusetts.

Shirley, Massachusetts Quadrangle

Latitude: 42°35'17" Longitude: 71°39'09"

Facilities

Affected:

<u>Below Elevation 320</u>	<u>Below Elevation 300</u>
28 houses	10 houses
storage building	motel
gun club building	Route 2A
motel	Townsend Road
barn	Longley Road
3000 feet of Groton Road	Parker Road
Route 2A	
Mulpus Road	<u>Below Elevation 285'</u>
Townsend Road	1 house
Longley Road	Route 2A
Parker Road	Townsend Road
	Longley Road

SITE NA-0905 (cont'd)

Geologic
Conditions:

Both abutments are thin glacial till, shallow to bedrock, with some rock outcrops on the left abutment. Depth to schist bedrock in the foundation is not known, but may be 5 to 10 feet. There are no apparent leakage problems. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear good.

Engineering
Notes:

The recommended location for an emergency spillway is at the left abutment.

SITE NA-0906

Location:

On Mulpus Brook approximately 2,500 feet upstream in Shirley, Massachusetts.

Shirley, Massachusetts Quadrangle

Latitude: 42°34'37" Longitude: 71°38'13"

Facilities
Affected:

<u>Below Elevation 320</u>	<u>Below Elevation 300</u>
44 houses	22 houses
lumber yard	lumber yard
restaurant	restaurant
store	store
gas station	gas station
auto dump	auto dump
motel	storage building
storage building	shell club
shell club	650 feet of Groton Road
3000 feet of Groton Rd.	14000 feet of Route 2A
14000 feet of Route 2A	3200 feet of Mulpus Road
3200 feet of Mulpus Road	<u>Below Elevation 280</u>
	1 house

Geologic -
Conditions:

Both abutments are thin glacial till, shallow to bedrock, with some rock outcrops on the left abutment. Depth to schist bedrock in the foundation is not known, but may be 5 to 10 feet. There are no apparent leakage problems. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear good.

SITE NA-0906 (cont'd)

Engineering

Notes:

The recommended location for an emergency spillway is at the left abutment.

SITE NA-0907

Location:

On Mulpus Brook approximately 2,200 feet upstream from Valley Island Road in Lunenburg, Massachusetts.

Shirley, Massachusetts Quadrangle

Latitude: 42°37'01" Longitude: 71°43'28"

Facilities

Affected:

Below Elevation 440
250 feet of Holman Road

Geologic

Conditions:

The right abutment is thin englacial drift, shallow to bedrock. The left abutment is thin englacial drift with schist outcropping at higher elevations. Depth to schist bedrock in the foundation is not known, but may be 10 to 20 feet. There are leakage problems in the right abutment and the foundation. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear good provided a positive cutoff can be made beneath the sand terrace in the foundation.

Engineering

Notes:

The recommended location for an emergency spillway is at the left abutment.

SITE NA-0908

Location:

On Flurcum Swamp approximately 2,200 feet upstream from Route 2A in Lunenburg, Massachusetts.

Shirley, Massachusetts Quadrangle

SITE NA-0908 (cont'd)

Latitude: $42^{\circ}35'31''$ Longitude: $71^{\circ}41'36''$

Facilities

Affected: 700 feet of Arbor Street

Geologic

Conditions: Both abutments are outwash sand and gravel and swamp at lower elevations. Depth to schist bedrock in the foundation is not known but may be 55 to 65 feet. There are leakage problems in both abutments and the foundation. Impervious borrow material for dam construction was not located on site. Water-holding capabilities appear poor.

Engineering

Notes: The recommended location for an emergency spillway is at the left abutment.

Public

Ownership: About 5% of the site is owned by the Town of Lunenburg.

SITE NA-0909 -- HICKORY HILLS LAKE

(Formerly Dickinson Pond)

Location: Near Townsend Harbor Road in Lunenburg,
Massachusetts.

Shirley, Massachusetts Quadrangle.

<u>Surface Area</u> <u>(Acres)</u>	<u>Height of</u> <u>Dam (Ft.)</u>	<u>Drainage Area</u> <u>(Acres) (Sq. Mi.)</u>	
330	20	4850	7.6

Potential
for

Expansion: Appears to have potential for expansion.
A very long dam would be required and
many cottages would be affected.

Remarks:

This is a long earth-fill dam. The
concrete spillway has eight bays
equipped with flashboards, outletting
on a rock riprapped chute. Gate works
appear inoperative. Structure appears
in fair condition; there are a few
cracks in the concrete.

SUMMARY DATA FOR POTENTIAL UPSTREAM RESERVOIR SITES

STUDY AREA-NASHUA RIVER									
SUBWATERSHED-MULPUS BROOK									
BENEFICIAL POOL									

SUMMARY DATA FOR POTENTIAL UPSTREAM RESERVOIR SITES

STUDY AREA-NASHUA RIVER

SUBWATERSHED-MULPUS BROOK

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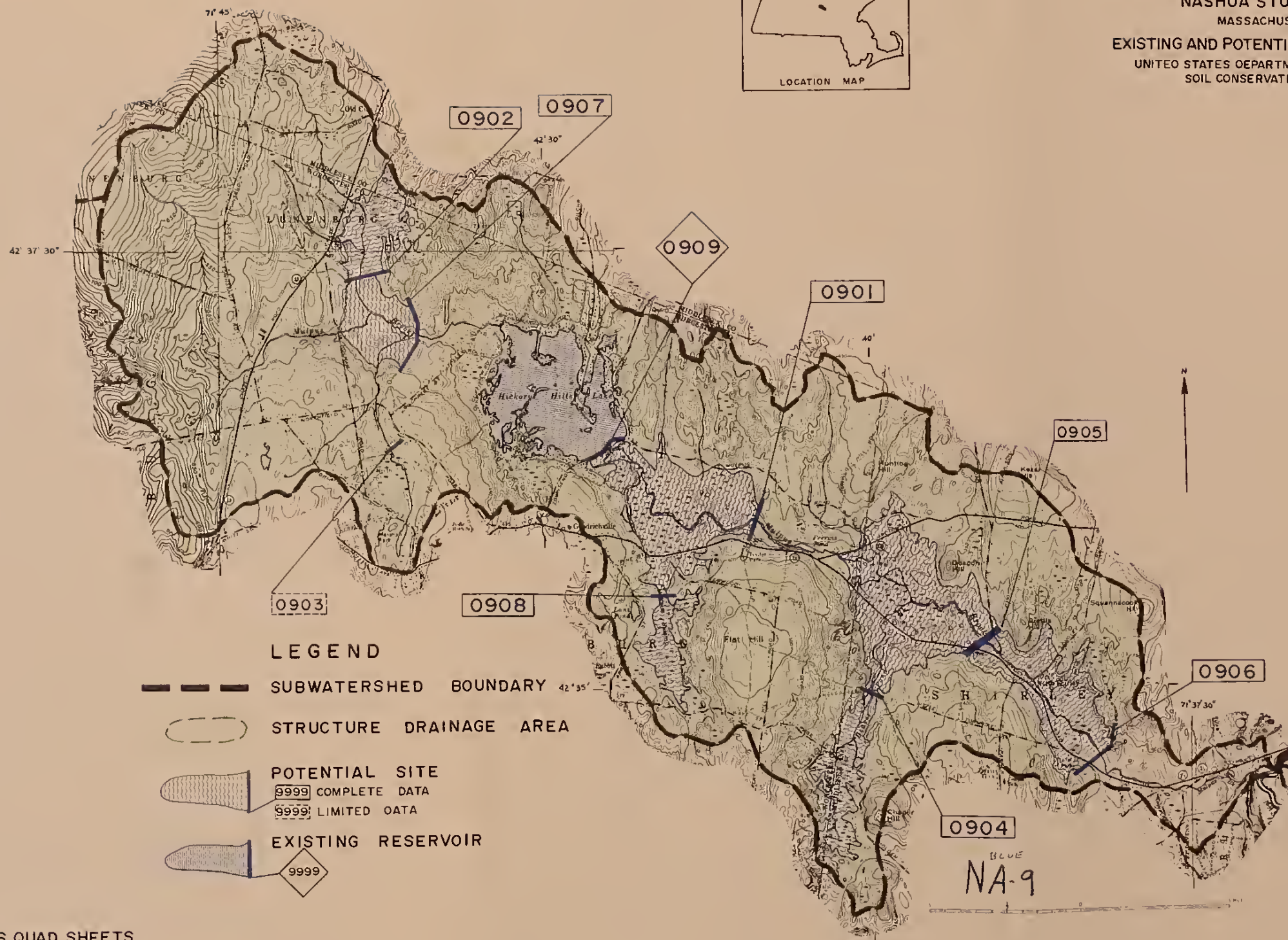
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-242-

Notes

MULPUS BROOK (NA-9)
NASHUA STUDY AREA
MASSACHUSETTS

EXISTING AND POTENTIAL RESERVOIR SITES
UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE



SOURCE: USGS QUAD SHEETS
ASHBY-1965
AYER-1966
FITCHBURG-1954
SHIRLEY-1965
TOWNSEND-1965

NASHUA STUDY AREA
SITE DATA FOR

Subwatershed NA-10, Squannacook River

The Massachusetts portion of the Squannacook River Subwatershed covers about 36,300 acres in Ashburnham, Fitchburg, and Lunenburg, in Worcester County and Ashby, Groton, Pepperill, Shirley and Townsend, in Middlesex County.

There is a U. S. Geological Survey stream gaging station on the Squannacook River in Shirley.

The Squannacook River originates in New Hampshire and flows southerly through Ashby, Townsend, Groton and Shirley to its confluence with the Nashua River. Elevations in Massachusetts range from a high of about 1,500 feet on Blood Hill to about 200 feet at the confluence. Geology in the subwatershed is characterized by schist bedrock at depths of 5 to 20 feet overlain by glacial till or outwash sand and gravel. Some granitic bedrock at depths of 50 to 100 feet was noted in the area of West Townsend.

Twenty-three potential reservoir sites and five existing reservoirs were studied. Design summaries are included for 16 potential sites that met study criteria.

SITE NA-1001

Location: On Trapfall Brook at Harris Road in Ashby, Massachusetts.

Ashby, Massachusetts Quadrangle

Latitude: 42°41'23" Longitude: 71°49'20"

Facilities

Affected:

<u>Below Elevation 880</u>	<u>Below Elevation 875</u>
4 houses	3 houses
2 barns	2 barns
900 feet of New Ipswich Road	550 feet of New Ipswich Road
1500 feet of Harris Road	1500 feet of Harris Road
<u>Below Elevation 870</u>	<u>Below Elevation 860</u>
2 houses	1 house
2 barns	1 barn
100 feet of New Ipswich Rd.	1500 feet of Harris Road
1500 feet of Harris Road	

SITE NA-1001 (cont'd)

Geologic
Conditions:

Both abutments are silty sand and gravel (glacial till) with approximately 30 percent boulders. Depth to schist bedrock in the foundation is not known, but may be 10 to 15 feet. There are no apparent leakage problems. Impervious borrow material for dam construction is available on site. Waterholding capabilities appear good.

Engineering
Notes:

The recommended location for an emergency spillway is at the right abutment.

SITE NA-1002

Location:

On a tributary to Ashby Reservoir approximately 200 feet downstream from Piper Road in Ashby, Massachusetts.

Ashby, Massachusetts Quadrangle

Latitude: 42°39'55"

Longitude: 71°50'15"

Facilities
Affected:

<u>Below Elevation 995</u>	<u>Below Elevation 990</u>
1400 feet of Erickson Road	2 houses
2000 feet of Piper Road	1400 feet of Erickson Road
500 foot driveway	2000 feet of Piper Road
2 houses	500 foot driveway
3 barns	3 barns

Below Elevation 965
1 barn
2000 feet of Piper Road

Geologic
Conditions:

The left abutment is silty sand and gravel (glacial till). The right abutment is outwash sand, medium coarse with some gravel. Depth to schist bedrock in the foundation is not known, but may be 15 to 25 feet. There is a slight leakage problem in the right abutment. Impervious borrow material for dam construction is available on site. Waterholding capabilities are fair.

Engineering
Notes:

The recommended location for an emergency spillway is at the left abutment.

SITE NA-1003 -- ASHBY RESERVOIR

Location: On Willard Brook, 3000 feet upstream
of South Village in Ashby, Massachusetts.

Ashby, Massachusetts Quadrangle.

Latitude: $42^{\circ}39'40''$ Longitude: $71^{\circ}49'37''$

<u>Surface Area</u> <u>(Acres)</u>	<u>Height of</u> <u>Dam (Ft.)</u>	<u>Drainage Area</u>	
		<u>(Acres)</u>	<u>(Sq. Mi.)</u>
42	15	2730	4.27

Potential
for

Expansion: Could be expanded, but cottages and South
Road would be affected and dam would have
to be rebuilt.

Remarks: This is an earth-fill dam. The spillway at
the right abutment is an ogee section about
40 feet wide. Slopes of the dam are covered
with trees. There is some slope erosion
visible on the upstream slope. Entire
structure is in fair condition.

Geologic
Conditions:

Both abutments are thin discontinuous outcrops
of silt sand and gravel glacial till underlain
by schist bedrock. There are no apparent
leakage problems, but there could be some
seepage through the left abutment. Impervious
borrow material for dam construction is available
on site. Waterholding capabilities appear good.

SITE NA-1004

Location: On an unnamed stream near Wright Pond approximately 1900 feet downstream from Richardson Road in Ashby, Massachusetts.

Ashby, Massachusetts Quadrangle

Latitude: $42^{\circ}39'02''$ Longitude: $71^{\circ}48'42''$

Facilities

Affected:

<u>Below Elevation 990</u>	<u>Below Elevation 985</u>
2 houses	2 houses
12 cottages	12 cottages
10 sheds	10 sheds
1500 feet of Richardson Road	1100 feet of Richardson Road
<u>Below Elevation 980</u>	<u>Below Elevation 975</u>
1 house	1 house
12 cottages	1 shed
10 sheds	

Geologic

Conditions:

Both abutments are thin discontinuous deposits of silty sand and englacial drift with many outcrops of schist bedrock. Depth to schist bedrock in the foundation is not known, but may be 5 to 10 feet. There are no apparent leakage problems. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear good.

Engineering

Notes:

The recommended location for an emergency spillway is at the left abutment.

SITE NA-1005

Location: On Trapfall Brook approximately 4100 feet upstream from Greenville Road in Ashby, Massachusetts.

Ashby, Massachusetts Quadrangle

Latitude: $42^{\circ}41'00''$ Longitude: $71^{\circ}48'18''$

SITE NA-1005 (cont'd)

Facilities

Affected:

Below Elevation 770

3 houses

1 barn

1700 feet of Mason Road

1700 feet of Foster Road

Below Elevation 760

1 house

625 feet of Mason Road

Geologic

Conditions:

Both abutments are sand and gravel (englacial drift) with cobbles and boulders and very shallow to bedrock. There is schistose rock at the surface of the stream at the foundation. There are no apparent leakage problems. Impervious borrow material for dam construction was not located on site. Water-holding capabilities appear good.

Engineering

Notes:

The recommended location for an emergency spillway is at the right abutment. Water-holding capabilities appear good providing there is a shallow cut-off trench to bedrock at both abutments.

SITE NA-1006

Location:

On Pearl Hill Brook approximately 2,500 feet upstream from Old Battery Road in Townsend, Massachusetts.

Ashby, Massachusetts Quadrangle

Latitude: 42°40'16"

Longitude: 71°45'22"

Facilities

Affected:

Below Elevation 360

1 house

Geologic

Conditions:

The left abutment is silty and gravel (glacial till). The right abutment is outwash sand and gravel. Depth to granite gneiss bedrock in the foundation is not known but may be 80 to 100 feet deep. There are leakage problems in the foundation and the right abutment. Impervious borrow material for dam construction was not located on site. Water-holding capabilities appear very poor.

SITE NA-1006 (cont'd)

Engineering
Notes:

The recommended location for an excavated emergency spillway is at the right abutment. Well fields for the Town of Townsend are below the centerline of the dam. Preliminary structure designs indicate that a concrete emergency spillway (chute or drop structure) may be needed to avoid excessive velocity in an excavated emergency spillway.

Public
Ownership:

The Massachusetts Department of Natural Resources owns about 95% of this site.

SITE NA-1007

Location:

On Walker Brook approximately 3,600 feet upstream from Mason Road in Townsend, Massachusetts.

Ashby, Massachusetts Quadrangle

Latitude: 42°40'55" Longitude: 71°45'03"

Facilities
Affected:

This site has been eliminated from further study due to excessive facilities and poor geologic conditions.

Geologic
Conditions:

Both abutments are outwash sand and gravel. Depth to granitic bedrock in the foundation is not known but may be 90 to 100 feet. There are leakage problems in both abutments and the foundation. Impervious borrow material for dam construction was not located on site. Water-holding capabilities are poor.

Engineering
Notes:

The recommended location for an emergency spillway is at the right abutment.

SITE NA-1008

Location: At outlet to Ash Swamp approximately
500 feet upstream (East) of Mason Road
in Townsend, Massachusetts.

Ashby, Massachusetts Quadrangle

Latitude: $42^{\circ}41'17''$ Longitude: $71^{\circ}45'03''$

Facilities
Affected:

Below Elevation 325

1 house
2800 feet of Old Turnpike Road

Geologic
Conditions:

Both abutments are outwash sand and gravel.
Depth to granitic bedrock in the foundation
is not known but may be 50 to 60 feet. There
are leakage problems in both abutments and
possibly in the foundation. Impervious
borrow material for dam construction was
not located on site. Waterholding
capabilities are poor.

Engineering
Notes:

The recommended location for an emergency
spillway is at the right abutment.

Public
Ownership:

About 20% of the site is owned by the
Massachusetts Department of Natural Resources.

SITE NA-1009

Location: On Bayberry Hill Brook approximately
600 feet upstream from Bayberry Hill
Road in Townsend, Massachusetts.

Townsend, Massachusetts Quadrangle

Latitude: $42^{\circ}39'17''$ Longitude: $71^{\circ}43'49''$

Remarks:

This site did not meet criteria for this study
due to the small contributing drainage area,
(303 acres). Therefore, no further investigations
were made.

SITE NA-1010

Location: On Squannacook River approximately 350 feet upstream from Turnpike Road in Townsend, Massachusetts.

Townsend, Massachusetts Quadrangle

Latitude: $42^{\circ}40'39''$ Longitude: $71^{\circ}43'33''$

Facilities Affected: This site was eliminated from further study due to high damage to facilities; Boston & Maine Railroad, Route 119, Mason Road, and housing.

SITE NA-1011

Location: On Squannacook River approximately 2000 feet upstream from Route 119 in Townsend, Massachusetts.

Townsend, Massachusetts Quadrangle

Latitude: $42^{\circ}40'25''$ Longitude: $71^{\circ}42'40''$

Facilities Affected:

<u>Below Elevation 310</u>	<u>Below Elevation 305</u>
16 houses	9 houses
1 barn	1 barn
400 feet of Turnpike Road	400 feet of Turnpike Road
500 feet of secondary road	500 feet of secondary road

Below Elevation 300

2 houses

400 feet of Turnpike Road

500 feet of secondary road

Geologic Conditions: Both abutments are outwash sand and gravel. Depth to schist bedrock in the foundation is not known but may be 70 to 80 feet. There are leakage problems in both abutments and the foundation. Impervious borrow material for dam construction was not located on site. Water-holding capabilities appear poor.

SITE NA-1011 (Cont'd)

Engineering
Notes:

The recommended location for an excavated emergency spillway is at the left abutment. Inflow is sufficient to overcome a considerable seepage loss and on this basis the site would be good. Preliminary structure designs indicate that a concrete drop structure would probably be the primary emergency spillway.

Public
Ownership:

About 5% of the site is owned by the Massachusetts Department of Natural Resources.

SITE NA-1012 -- BIXBY RESERVOIR

Location:

On a tributary to Bixby Brook, approximately 1800 feet upstream of Emery Road in Townsend, Massachusetts.

Townsend, Massachusetts Quadrangle.

Latitude: 42°38'25"

Longitude: 71°42'54"

Surface Area
(Acres)

Height of
Dam (Ft.)

Drainage
(Acres)

Area
(Sq. Mi.)

21

12

590

0.92

Potential
for
Expansion:

Geologic conditions might limit further expansion. No facilities would be affected.

Remarks:

This is an earth-fill dam with a 15 foot wide chute spillway. The spillway and dam are in good condition, except for some trees growing in the fill.

Geologic
Conditions:

Both abutments are fine, poorly graded sand with some gravel, glacial outwash, and kame terrace. Depth to schist bedrock in the foundation is not known, but may be 80 to 90 feet. There are leakage problems in both abutments and the foundation. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear fair to poor.

SITE NA-1013

Location: On Witch Brook approximately 800 feet
upstream from Warren Road in Townsend,
Massachusetts.

Townsend Massachusetts Quadrangle

Latitude: $42^{\circ}38'24''$ Longitude: $71^{\circ}40'29''$

Facilities
Affected: No facilities affected below elevation 300.

Geologic
Conditions: The left abutment is poorly graded sand,
possibly bedded kame terrace. The right
abutment is poorly graded sand and gravel-
small esker. Depth to schist bedrock in
the foundation is not known, but may be
40 to 50 feet. There are leakage problems
in both abutments and possibly in the
foundation. Impervious borrow material for
dam construction was not located on site.
Waterholding capabilities appear poor.

Engineering
Notes: The recommended location for an emergency
spillway is at the left abutment.

SITE NA-1014

Location: On Witch Brook approximately 600 feet
upstream from Pierce Road in Townsend,
Massachusetts.

Townsend Massachusetts Quadrangle

SITE NA-1014 (Cont'd)

Latitude: $42^{\circ}37'44''$ Longitude: $71^{\circ}41'22''$

Facilities

Affected: No facilities affected below elevation 365.

Geologic

Conditions: The left abutment is outwash sand and gravel. The right abutment is kame terrace sand and gravel. Depth to bedrock in the foundation is not known, but may be 15 to 25 feet. There are leakage problems in both abutments and possibly in the foundation. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear poor.

Engineering

Notes: The recommended location for an emergency spillway is at the right abutment. Drilling may prove hills to be bedrock cored.

SITE NA-1015

Location: On Squannacook River near town boundary between Shirley and Townsend in Shirley, Massachusetts.

Townsend Massachusetts Quadrangle

Latitude: $42^{\circ}38'03''$ Longitude: $71^{\circ}39'35''$

Remarks:

Drainage Area: 56 square miles
This site did not meet criteria for this study. Contributing drainage area is larger than 50 square miles. Therefore, no further investigations were made.

SITE NA-1016

Location: On Trap Swamp Brook approximately 250 feet
upstream from Squannacook Road in
Shirley, Massachusetts.

Shirley Massachusetts Quadrangle

Latitude: $42^{\circ}36'45''$ Longitude: $71^{\circ}39'00''$

Remarks: This site did not meet criteria for this
study due to the small contributing drainage
area (218 acres). Therefore, no further
investigations were made.

SITE NA-1017

Location: On a tributary to the Squannacook River
approximately 500 feet upstream from
Proctor Road in Townsend, Massachusetts.

Townsend Massachusetts Quadrangle

Latitude: $42^{\circ}39'37''$ Longitude: $71^{\circ}39'46''$

Facilities
Affected: Below Elevation 320

3 houses
600 feet of West Street
2500 feet of Haynes Road

Below Elevation 315

2 houses
550 feet of West Street
2500 feet of Haynes Road

Below Elevation 310

1 house
2500 feet of Haynes Road

SITE NA-1017 (Cont'd)

Geologic

Conditions:

Both abutments are outwash sand and gravel with 20 to 30 percent small cobbles, 4 to 6 inches in diameter at the surface. Depth to schist in the foundation is not known, but may be 30 to 40 feet. There are leakage problems in both abutments and the foundation. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear poor.

Engineering

Notes:

The recommended location for an emergency spillway is at the left abutment.

SITE NA-1018

Location:

On Bixby Brook approximately 1200 feet upstream from Meeting House Road in Townsend, Massachusetts.

Townsend Massachusetts Quadrangle

Latitude: 42°38'56" Longitude: 71°41'31"

Facilities

Affected:

No facilities affected below elevation 290.

SITE NA-1018 (Cont'd)

Geologic
Conditions:

Both abutments are fine, poorly graded sand with some gravel - complex glaciofluvial deposits. Depth to schist bedrock in the foundation is not known but may be 40 to 50 feet. There are leakage problems in both abutments and the foundation. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear poor.

Engineering
Notes:

The recommended location for an excavated emergency spillway is at the left abutment. Preliminary structure designs indicate that a concrete emergency spillway (monolithic conduit) may be required to avoid excessive velocity in an excavated spillway.

Public
Ownership:

About 10% of the site is owned by the Massachusetts Department of Natural Resources.

SITE NA-1019

Location:

On a tributary to Ashby Reservoir approximately 700 feet upstream from South Road in Ashby, Massachusetts.

Ashby, Massachusetts Quadrangle

Latitude: 42°38'52" Longitude: 71°50'01"

Facilities
Affected:

Below Elevation 980

2 houses
1 barn
1450 feet of Piper Road
1250 feet of Richardson Road

Below Elevation 975

2 houses
1 barn
1000 feet of Piper Road

Below Elevation 965

400 feet of Piper Road

Below Elevation 960

250 feet of Piper Road

SITE NA-1019 (cont'd)

Geologic

Conditions:

The right abutment is sand and gravel at the toe and glacial till higher on the abutment. The left abutment is outwash fine sand. Depth to schist bedrock in the foundation is not known but may be 40 to 50 feet. There are leakage problems in both abutments but leakage should not be high. Impervious borrow material for dam construction is available on site; however, rock greater than 6 inches may run 10 per cent. Water-holding capabilities appear fair.

Engineering

Notes:

The recommended location for an emergency spillway is at the right abutment.

SITE NA-1020

Location:

On Locke Brook approximately 250 feet upstream from Route 31 in Ashby, Massachusetts.

Ashby, Massachusetts Quadrangle

Latitude: 42°41'49" Longitude: 71°47'20"

Facilities

Affected:

Below Elevation 700

5 houses

2 barns

1000 feet of Locke Road

900 feet of Heywood Road

Below Elevation 690

4 houses

1 barn

1000 feet of Locke Road

700 feet of Heywood Road

Below Elevation 685

2 houses

1000 feet of Locke Road

550 feet of Heywood Road

Below Elevation 665

1 house

500 feet of Locke Road

Geologic

Conditions:

The left abutment is glacial till, shallow to bedrock. The right abutment is sand and gravel terrace at lower elevations and glacial till at higher elevations, shallow to bedrock. Depth to schist bedrock in the foundation is not known but may be 15 to 20 feet.

SITE NA-1020 (Cont'd)

Geologic
Conditions:
(Cont'd)

There are leakage problems in the foundation and on the lower elevations in the right abutment. Impervious borrow material for dam construction is available on site; however, rock greater than 6 inches may run 30 percent. Waterholding capabilities appear good provided a positive cutoff is made through the sand and gravel terrace in the foundation and the right abutment.

Engineering
Notes:

The recommended location for an emergency spillway is at the right abutment.

SITE NA-1021

Location:

On Trapfall Brook approximately 400 feet upstream from Jones Hill Road in Ashby, Massachusetts.

Ashby Massachusetts Quadrangle

Latitude: $42^{\circ}41'50''$ Longitude: $71^{\circ}49'19''$

Facilities
Affected:

No facilities affected below elevation 880.

Geologic
Conditions:

The right abutment is outwash sand and gravel and shallow to bedrock. The left abutment is glacial till silty sand with 30 percent cobbles and boulders, shallow to bedrock. Depth to schist bedrock in the foundation is not known but may be 15 to 25 feet. There are leakage problems in the right abutment and the foundation. Impervious borrow material for dam construction is available on site. Waterholding capabilities appear fair depending upon whether a positive cutoff is made on the right abutment.

Engineering
Notes:

The recommended location for an emergency spillway is at the left abutment.

SITE NA-1022

Location: On a tributary to Trapfall Brook approximately
1400 feet downstream from Mason Road in
Ashby, Massachusetts.

Ashby, Massachusetts Quadrangle

Latitude: $42^{\circ}41'26''$ Longitude: $71^{\circ}48'04''$

Remarks: This site did not meet criteria for this study
due to the small contributing drainage area,
(191 acres). Therefore, no further investigations
were made.

SITE NA-1023

Location: On a tributary to the Squannacook River
approximately 850 feet upstream from
Townsend Road in Groton, Massachusetts.

Townsend, Massachusetts Quadrangle

Latitude: $42^{\circ}38'20''$ Longitude: $71^{\circ}38'57''$

Facilities

Affected: Below Elevation 270

3000 feet of Townsend Road

Geologic

Conditions:

The left abutment is thin silty sand and
gravel underlain by till or bedrock. The
right abutment is outwash sand and gravel.
Depth to schist bedrock in the foundation
is not known but may be 15 to 25 feet.
There are leakage problems in both abutments.
Impervious borrow material for dam construction
is available on site; however, rock size
greater than 6 inches may run 15 percent.
Waterholding capabilities appear poor.

Engineering

Notes:

The recommended location for an emergency
spillway is at the left abutment.

SITE NA-1024

Location: On a tributary to Trapfall Brook approximately 3000 feet upstream from Foster Road in Ashby, Massachusetts.

Ashby Massachusetts Quadrangle

Latitude: $42^{\circ}41'14''$ Longitude: $71^{\circ}47'33''$

Facilities

Affected: No affected facilities below elevation 735

Geologic

Conditions: Both abutments are englacial drift or glacial till with cobbles and boulders. Depth to bedrock in the foundation is not known. There are no apparent leakage problems. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear good.

Engineering

Notes: The recommended location for an emergency spillway is at the left abutment.

SITE NA-1025 -- FITCHBURG RESERVOIR

Location: On Willard Brook, 1500 feet upstream
of Richardson Road in Ashby, Massachusetts.

Ashby, Massachusetts-N.H. Quadrangle.

<u>Surface Area</u> <u>(Acres)</u>	<u>Height of</u> <u>Dam (Ft.)</u>	<u>Drainage</u> <u>(Acres)</u>	<u>Area</u> <u>(Sq. Mi.)</u>
147	30	1340	2.1

Potential
for

Expansion:

Limited by size of drainage area.

Remarks:

This is an earth dam with a 70 foot wide
ogee spillway. Upstream slope of the dam
is rip-rapped. Dam and spillway are in
good condition.



SITE NA-1026 -- HARBOR POND

Location: Upstream of Harbor Road in Townsend,
Massachusetts.

Townsend, Massachusetts Quadrangle.

<u>Surface Area</u> <u>(Acres)</u>	<u>Height of</u> <u>Dam (Ft.)</u>	<u>Drainage</u> <u>(Acres)</u>	<u>Area</u> <u>(Sq. Mi.)</u>
43	13	38,400	60

Potential
for

Expansion: Expansion limited by Boston and Maine Railroad
and houses on left abutment.

Remarks:

This is a stone block masonry dam.
The spillway is about 90 feet wide.
Structure is in fair condition.



SITE NA-1027 -- GRAVES POND

Location: 100 feet upstream of Emery Road in
Townsend, Massachusetts.

Townsend, Massachusetts Quadrangle

<u>Surface Area</u> <u>(Acres)</u>	<u>Height of</u> <u>Dam (Ft.)</u>	<u>Drainage Area</u>	
		<u>(Acres)</u>	<u>(Sq. Mi.)</u>
4	6	680	1.06

Potential
for

Expansion: Some expansion of the pond is possible.

Remarks: This is a small dam. The spillway is
constructed of stone rubble masonry.
Both the dam and weir are in poor condition.

SUMMARY DATA FOR POTENTIAL UPSTREAM RESERVOIR SITES

STUDY AREA-NASHUA RIVER										SUBWATERSHED-SQUANNACOOK RIVER									
BENEFICIAL POOL										EMERGENCY SPILLWAY									
ELEV	STORAGE	PER AC FT	AREA	COST SURF AC	DEPTH AT DAM	CREST ELEV	STORAGE AT CREST	COST PER AC FT	DESIGN HIGH WATER	DAM	YIELD	PERCENT CHANCE	FILL VOL (1000 CY)	HGT	ELEV	TOP	AREA	ELEV	DESIGN
(MSL)	AC FT	IN	(AC)	(\$)	(FT)	TYPE	AC FT	IN	(MSL)	(AC)	(MSL)	(CY)	(1000)	FT	(MSL)	(CY)	(AC)	(MSL)	(CY)
NA-1001										NA-1002									
DA= 1.70 SQ MI = 1088 AC										DA= 0.90 SQ MI = 576 AC									
STREAM WATER QUALITY (B) 100-YR PRIN SPWY DESIGN STORM										USGS QUAD- ASHBY MASS									
SITE RATING (1)										SITE RATING (2)									
839.0	0	0.0	3	8.0	8.0	853.0	E	376	4.1	1370	855.5	57	858.5	28	52	52	52	52	52
846.3	100	1.1	5180	27	19370	15.2	E	363	4.0	1430	855.1	56	857.5	27	47	47	47	47	47
856.1	533	5.9	1280	59	11520	25.2	E	703	7.8	970	861.0	76	863.3	32	77	77	77	77	77
864.9	1183	13.1	830	94	10430	33.9	E	1446	16.0	680	869.8	118	872.5	42	148	148	148	148	148
872.5	2038	22.5	640	127	10230	41.5	E	2377	26.2	550	877.0	143	880.0	49	227	227	227	227	227
NA-1002										NA-1003									
DA= 0.50 SQ MI = 320 AC										USGS QUAD- ASHBY MASS									
STREAM WATER QUALITY (B) 100-YR PRIN SPWY DESIGN STORM										USGS QUAD- ASHBY MASS									
SITE RATING (1)										SITE RATING (2)									
953.8	0	0.0	2	7.8	7.8	970.0	E	199	4.1	1590	972.5	36	975.5	30	23	23	23	23	23
966.5	100	2.0	3240	21	15400	20.5	E	168	3.5	1930	971.4	33	973.0	27	18	18	18	18	18
972.0	257	5.4	1540	35	11460	26.0	E	356	7.3	1110	977.0	45	979.1	33	31	31	31	31	31
976.1	415	8.6	1140	43	11080	30.2	E	535	11.1	890	981.0	54	983.4	37	42	42	42	42	42
981.0	651	13.6	990	54	11970	35.0	E	803	16.7	810	986.0	70	988.9	43	59	59	59	59	59
982.5	729	15.2	930	59	11520	36.5	E	894	18.6	760	987.0	74	989.5	43	62	62	62	62	62
NA-1004										NA-1005									
DA= 0.50 SQ MI = 320 AC										USGS QUAD- ASHBY MASS									
STREAM WATER QUALITY (B) 100-YR PRIN SPWY DESIGN STORM										USGS QUAD- ASHBY MASS									
SITE RATING (1)										SITE RATING (2)									
972.0	0	0.0	13	0.0	0.0	978.5	E	147	5.5	3220	981.0	32	984.0	12	5	5	5	5	5
976.5	100	3.8	4830	20	23870	4.6	E	159	6.0	3030	981.4	35	983.5	11	4	4	4	4	4
979.1	158	5.9	3240	24	21020	7.1	E	237	8.8	2170	984.0	52	986.5	15	7	7	7	7	7
981.1	217	8.1	2480	34	15910	9.2	E	326	12.2	1650	985.1	60	987.8	16	8	8	8	8	8
982.5	266	10.0	2110	42	13280	10.5	E	396	14.7	1420	986.0	66	988.6	17	9	9	9	9	9

NOTES - (1) COSTS ARE BASED ON 1971 S.C.S. DESIGN CRITERIA AND COST DATA.

(2) EMERGENCY SPILLWAY STORAGE AND COSTS ARE BASED ON TOTAL STORAGE, INCLUDING BENEFICIAL POOL.

(3) EMERGENCY SPILLWAY TYPE CODE- C=CONCRETE CHUTE, D=CONCRETE DROP, E=EXCAVATED, T= TWO SPILLWAYS, N= NONE

(4) TABULAR DATA ARE BASED ON PRELIMINARY INFORMATION. FIGURES SHOWN ARE PRIMARILY FOR COMPARISON PURPOSES.

(5) ELEVATIONS ARE SHOWN TO THE NEAREST 0.1 FOOT TO SHOW VARIATION BETWEEN DEVELOPMENTS ONLY, AND ARE NOT TO BE CONSIDERED ACCURATE TO THAT DEGREE.

** DO NOT USE FOR FINAL SITE SELECTION OR LAND ACQUISITION. **

SUMMARY DATA FOR POTENTIAL UPSTREAM RESERVOIR SITES

STUDY AREA-NASHUA RIVER										SUBWATERSHED-SQUANNACOOK RIVER									
BENEFICIAL POOL										EMERGENCY SPILLWAY									

SUMMARY DATA FOR POTENTIAL UPSTREAM RESERVOIR SITES

STUDY AREA-NASHUA RIVER															SUBWATERSHED-SQUANNACOOK RIVER																								
BENEFICIAL POOL										EMERGENCY SPILLWAY					DESIGN					DAM																			
ELEV	STORAGE	PER AC FT	COST	AREA	SURF AC	COST/AC	DEPTH AT DAM	CREST ELEV	STORAGE AT CREST	COST PER AC FT	ELEV	AREA	TOP ELEV	HGT	FILL VOL	PERCENT CHANCE	AT 95	SAFE YIELD																					
(MSL)	AC FT	IN	(\$)	(AC)	(\$)	(FT)	(FT)	(MSL)	AC FT	IN	(\$)	(MSL)	(AC)	(MSL)	FT	(1000 CY)	MGD																						
NA-1011										DA= 48.80 SQ MI = 31232 AC										LATITUDE 42-40-25 LONGITUDE 71-42-40																			
SITE RATING (3)										STREAM WATER QUALITY (B)										100-YR PRIN SPWY DESIGN STORM										RUNOFF = 8.10 IN, PEAK FLOW = 6565 CFS									
289.7	100	0.0	32620	99	32820	9.8		291.7	717	0.3	4550		296.1	180		13		1.42																					
NA-1013										DA= 1.90 SQ MI = 1216 AC										LATITUDE 42-38-24 LONGITUDE 71-40-29																			
SITE RATING (3)										STREAM WATER QUALITY (B)										100-YR PRIN SPWY DESIGN STORM										RUNOFF = 8.10 IN, PEAK FLOW = 332 CFS									
263.2	0	0.0		8		3.3		278.7	E	421	4.1	2400		281.2	46		24																						
269.4	100	1.0	10260	24	42350	9.3		277.9	E	388	3.8	2640		280.4	44		20																						
277.4	350	3.5	3170	39	28800	17.4		283.9	E	657	6.5	1690		286.2	57		36																						
285.4	726	7.1	1620	55	21330	25.4		287.9	E	885	8.7	1330		290.4	66		50																						
291.5	1102	10.8	1170	68	18970	31.5		294.0	E	1293	12.8	1000		296.4	78		81																						
292.5	1171	11.6	1130	70	18790	32.5		295.0	E	1367	13.5	970		297.5	80		88																						
NA-1014										DA= 1.30 SQ MI = 832 AC										LATITUDE 42-37-44 LONGITUDE 71-41-22																			
SITE RATING (3)										STREAM WATER QUALITY (B)										100-YR PRIN SPWY DESIGN STORM										RUNOFF = 8.10 IN, PEAK FLOW = 227 CFS									
343.7	0	0.0		8		1.7		350.6	E	288	4.1	2930		353.1	84		9																						
347.6	100	1.4	8630	44	19450	5.6		350.1	E	249	3.5	3460		352.5	81		8																						
352.6	427	6.1	2220	82	11620	10.6		355.1	E	658	9.5	1440		357.5	108		17																						
357.7	917	13.2	1130	110	9420	15.7		360.2	E	1217	17.6	850		361.9	136		29																						
361.7	1407	20.2	790	135	8240	19.7		364.2	E	1774	25.6	630		365.2	160		38																						
362.5	1505	21.7	750	140	8020	20.5		365.0	E	1889	27.2	590		365.9	164		40																						

NOTES - (1) COSTS ARE BASED ON 1971 S.C.S. DESIGN CRITERIA AND COST DATA.

(2) EMERGENCY SPILLWAY STORAGE AND COSTS ARE BASED ON TOTAL STORAGE, INCLUDING BENEFICIAL POOL.

(3) EMERGENCY SPILLWAY TYPE CODE- C=CONCRETE CHUTE, D=CONCRETE DROP, E=EXCAVATED, T= TWO SPILLWAYS, N= NONE

(5) ELEVATIONS ARE SHOWN TO THE NEAREST 0.1 FOOT TO SHOW VARIATION BETWEEN DEVELOPMENTS ONLY, AND ARE NOT TO BE CONSIDERED ACCURATE TO THAT DEGREE.

*** DO NOT USE FOR FINAL SITE SELECTION OR LAND ACQUISITION. ***

SUMMARY DATA FOR POTENTIAL UPSTREAM RESERVOIR SITES

STUDY AREA-NASHUA RIVER									
SUBWATERSHED-SQUANNACOOK RIVER									
BENEFICIAL POOL									

SUMMARY DATA FOR POTENTIAL UPSTREAM RESERVOIR SITES

STUDY AREA-NASHUA RIVER															SUBWATERSHED-SQUANNACOOK RIVER														
BENEFICIAL POOL																													
ELEV	STORAGE	PER AC FT	COST	AREA	SURF AC	DEPTH AT DAM	CREST ELEV	STORAGE AT CREST	COST PER AC FT	DESIGN HIGH WATER	DAM	SAFE YIELD																	
(MSL)	AC FT	IN	(\$)	(AC)	(\$)	(FT)	(MSL)	AC FT	IN	(\$)	(MSL)	(AC)	(MSL)	FT	CY	FILL VOL	HGT	ELEV	TOP	PERCENT CHANCE									
NA-1020															NA-1021														
DA= 2.90 SQ MI = 1856 AC															DA= 1.00 SQ MI = 640 AC														
STREAM WATER QUALITY (B)															STREAM WATER QUALITY (B)														
100-YR PRIN SPWY DESIGN STORM															100-YR PRIN SPWY DESIGN STORM														
RUNOFF = 8.10 IN, PEAK FLOW = 506 CFS															RUNOFF = 8.10 IN, PEAK FLOW = 174 CFS														
SITE RATING (1)															SITE RATING (2)														
649.4	0	0.0	8	5.4	669.5	E	642	4.1	1750	671.9	66	674.8	31	110															
665.7	422	2.7	3060	47	27740	21.7	674.2	E	958	6.1	1350	676.7	85	150															
675.9	1067	6.8	1460	82	18900	31.9	682.4	E	1710	11.1	910	684.9	118	253															
682.7	1712	11.1	1030	109	16200	38.7	687.2	E	2265	14.6	780	689.5	136	320															
690.5	2679	17.2	740	139	14370	46.5	693.0	E	3054	19.7	650	695.4	147	416															
692.5	2963	19.2	700	142	14540	48.5	695.0	E	3347	21.6	620	697.4	151	454															
NA-1023															NA-1023														
DA= 0.60 SQ MI = 384 AC															DA= 0.60 SQ MI = 384 AC														
STREAM WATER QUALITY (B)															STREAM WATER QUALITY (B)														
100-YR PRIN SPWY DESIGN STORM															100-YR PRIN SPWY DESIGN STORM														
RUNOFF = 8.10 IN, PEAK FLOW = 105 CFS															RUNOFF = 8.10 IN, PEAK FLOW = 105 CFS														
SITE RATING (3)															SITE RATING (3)														
258.1	0	0.0	5	2.0	266.5	E	133	4.1	6150	268.9	24	272.0	16	6															
265.1	100	3.0	8700	19	44760	9.1	267.6	E	157	4.9	5540	270.0	26	6															
267.6	152	4.8	5940	23	39970	11.6	270.1	E	218	6.8	4160	272.6	30	11															
269.7	205	6.4	4590	25	36920	13.7	272.2	E	279	8.7	3370	274.6	34	16															
271.7	257	8.0	3800	29	33820	15.7	274.2	E	340	10.6	2870	276.4	37	22															
272.5	280	8.8	3550	30	32790	16.5	275.0	E	367	11.5	2710	277.1	39	24															

NOTES - (1) COSTS ARE BASED ON 1971 S.C.S. DESIGN CRITERIA AND COST DATA.

- (2) EMERGENCY SPILLWAY STORAGE AND COSTS ARE BASED ON TOTAL STORAGE, INCLUDING BENEFICIAL POOL.
- (3) EMERGENCY SPILLWAY TYPE CODE- C=CONCRETE CHUTE, D=CONCRETE DROP, E=EXCAVATED, T= TWO SPILLWAYS, N= NONE
- (4) TABULAR DATA ARE BASED ON PRELIMINARY INFORMATION. FIGURES SHOWN ARE PRIMARILY FOR COMPARISON PURPOSES.
- (5) ELEVATIONS ARE SHOWN TO THE NEAREST 0.1 FOOT TO SHOW VARIATION BETWEEN DEVELOPMENTS ONLY, AND ARE NOT TO BE CONSIDERED ACCURATE TO THAT DEGREE.

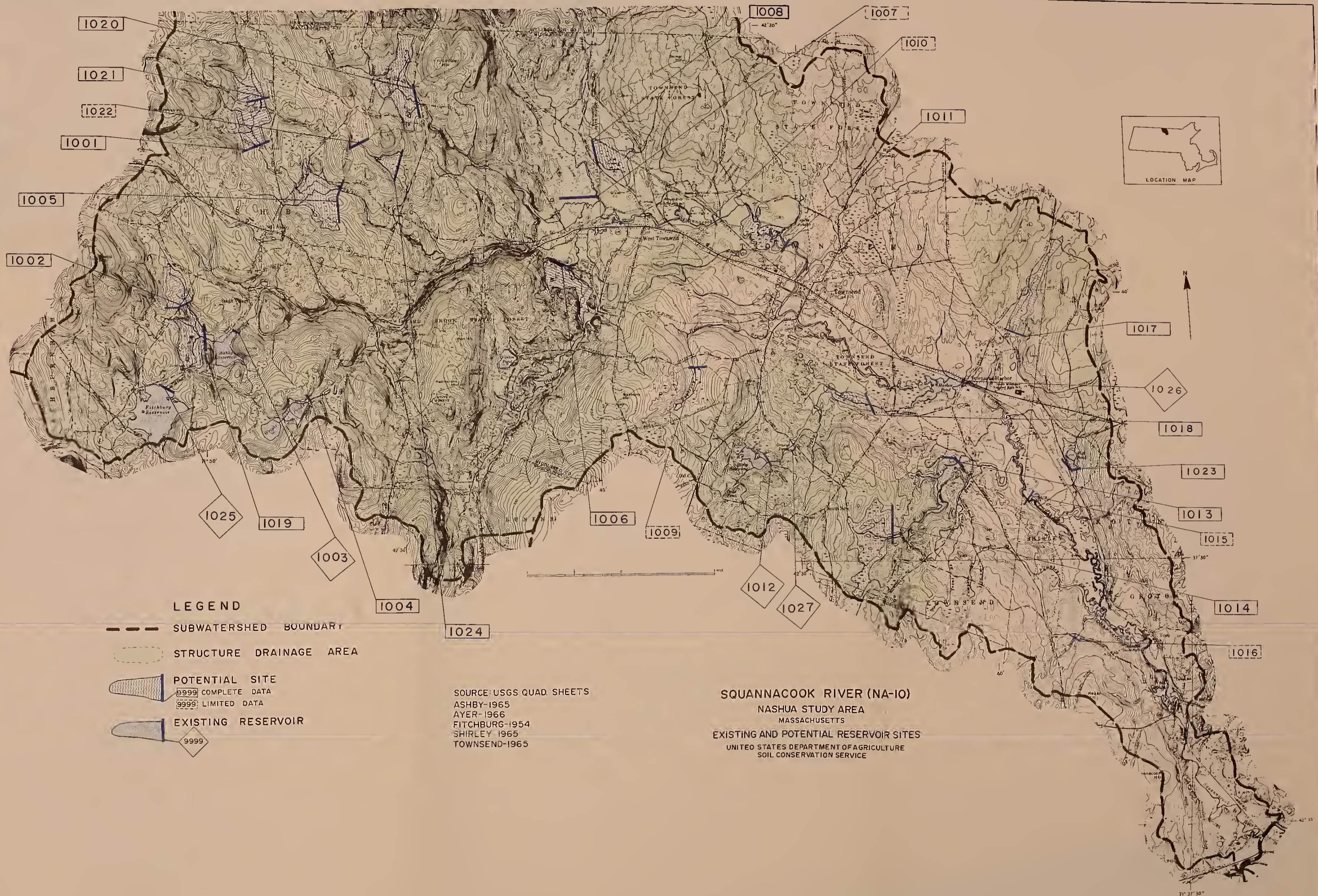
** DO NOT USE FOR FINAL SITE SELECTION OR LAND ACQUISITION. **

SUMMARY DATA FOR POTENTIAL UPSTREAM RESERVOIR SITES

STUDY AREA-NASHUA RIVER										SUBWATERSHED-SQUANNACOOK RIVER									
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BENEFICIAL POOL										*****									
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-270-

Notes



LEGEND

--- SUBWATERSHED BOUNDARY

STRUCTURE DRAINAGE AREA

POTENTIAL SITE

9999 COMPLETE DATA

9999 LIMITED DATA

EXISTING RESERVOIR

9999

SOURCE: USGS QUAD. SHEETS
ASHBY-1965
AYER-1966
FITCHBURG-1954
SHIRLEY 1965
TOWNSEND-1965

SQUANNACOOK RIVER (NA-10)

NASHUA STUDY AREA

MASSACHUSETTS

EXISTING AND POTENTIAL RESERVOIR SITES

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

NASHUA STUDY AREA
SITE DATA FOR

Subwatershed NA-11, Nashua River

The Massachusetts portion of this subwatershed covers about 31,600 acres in Ayer, Dunstable, Groton, Pepperell and Townsend, all in Middlesex County.

The Nashua River flows northeasterly through the watershed from Ayer through Groton and Pepperell into New Hampshire. The main tributary is the Nissitissit River, which originates in New Hampshire and flows southeasterly through Pepperell to the Nashua River. Elevations in Massachusetts range from a high of about 590 feet at Townsend Hill to about 170 feet on the Nashua River flood plain. Geology in the subwatershed is characterized by schist bedrock at depths of 15 to 25 feet, overlain by glacial till, englacial drift or outwash sand and gravel.

Twenty-four potential reservoir sites and two existing reservoirs were studied. Design summaries are included for eight potential sites that met survey criteria.

SITE NA-1101

Location: On Bancroft Brook approximately 1800 feet
upstream from Route 113 in Pepperell, Massachusetts.

Townsend, Massachusetts Quadrangle

Latitude: 42°39'03" Longitude: 71°38'22"

Remarks: This site did not meet criteria for this study
due to the small contributing drainage area,
(200 acres). Therefore, no further investigations
were made.

SITE NA-1102

Location: On Robinson Brook approximately 4900 feet
upstream from Shirley Street in Pepperell,
Massachusetts.

SITE NA-1102 (Cont'd)

Townsend, Massachusetts Quadrangle

Latitude: $42^{\circ}38'08''$ Longitude: $71^{\circ}37'37''$

Remarks:

This site did not meet criteria for this study due to the small contributing drainage area, (less than 0.5 square miles). Therefore, no further investigations were made.

SITE NA-1103

Location:

On Robinson Brook approximately 2,700 feet upstream from Shirley Street in Pepperell, Massachusetts.

Pepperell, Massachusetts Quadrangle

Latitude: $42^{\circ}37'59''$ Longitude: $71^{\circ}37'08''$

Facilities

Affected:

Below Elevation 280

Below Elevation 270

350 feet of Route 119

No facilities affected

Geologic

Conditions:

Both abutments are thin discontinuous outcrops of outwash sand and gravel underlain by silty sand and limey schist bedrock. Depth to bedrock in the foundation is not known but may be 15 to 25 feet. There are leakage problems in both abutments and the foundation. Impervious borrow material for dam construction is available on site; however, rock greater than 6 inches may run 15 percent. Waterholding capabilities would be good with a cutoff to till or bedrock. Limey shale appears to be tight but drilling would be required to determine permeability.

Engineering

Notes:

The recommended location for an emergency spillway is at the left abutment.

SITE NA-1104

Location: On Bancroft Brook approximately 400 feet upstream from Route 119 in Pepperell, Massachusetts.

Pepperell, Massachusetts Quadrangle

Latitude: 42°38'17" Longitude: 71°37'12"

Facilities
Affected:

Below Elevation 320

Below Elevation 300

2 houses
800 feet of Bancroft Street
500 feet of Townsend St. (Rte. 113)

Below Elevation 290

1 house

Geologic
Conditions:

Both abutments are thin discontinuous outwash sand and gravel underlain by schist bedrock. There is bedrock at the surface high on the right abutment. Depth to schist bedrock in the foundation is not known but may be 15 to 25 feet. There are leakage problems in both abutments. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear good if a cut-off is made to bedrock.

Engineering
Notes:

The recommended location for an emergency spillway is at the right abutment.

SITE NA-1105

Location: On a tributary to the Nashua River approximately 700 feet upstream from Mt. Lebanon Street in Pepperell, Massachusetts.

Pepperell Massachusetts Quadrangle

Latitude: 42°38'39" Longitude: 71°36'24"

Remarks:

This site did not meet criteria for this study due to the small contributing drainage area, (259 acres). Therefore, no further investigations were made.

SITE NA-1106

Location: On a tributary to Sucker Brook approximately 3,300 feet upstream from Heald Street in Pepperell, Massachusetts.

Pepperell, Massachusetts Quadrangle

Latitude: $42^{\circ}39'54''$ Longitude: $71^{\circ}37'12''$

Facilities

Affected:

Below Elevation 320

Below Elevation 310

3 houses

1 house

2000 feet of Jewett Street 2000 feet of Jewett Street

Geologic

Conditions:

Both abutments are silty sand and gravel glacial till with cobbles and boulders. Depth to schist bedrock in the foundation is not known but may be 20 to 25 feet. There are no apparent leakage problems. Impervious borrow material for dam construction is available on site; however, rock greater than 6 inches may run 15 percent. Water-holding capabilities appear good.

Engineering

Notes:

The recommended location for an emergency spillway is at the left abutment.

SITE NA-1107

Location: On a tributary to Gulf Brook approximately 650 feet upstream from Cranberry Street in Pepperell, Massachusetts.

Townsend, Massachusetts Quadrangle

Latitude: $42^{\circ}41'08''$ Longitude: $71^{\circ}38'26''$

Remarks:

Drainage Area: 496 acres
This site does not meet criteria for this study. At the maximum feasible pool level, the depth at dam is less than 7 feet. Therefore, no further investigations were made.

SITE NA-1108

Location: On Gulf Brook approximately 100 feet downstream from Oak Hill Street in Pepperell, Massachusetts.

Townsend, Massachusetts Quadrangle

Latitude: 42°41'30" Longitude: 71°37'47"

Facilities
Affected:

Below Elevation 310

2 houses
2 barns
900 feet of Oakhill Street
1150 feet of Cranberry Street

Below Elevation 300

1 barn
900 feet of Oakhill Street
1150 feet of Cranberry Street

Below Elevation 290

700 feet of Oakhill Street
650 feet of Cranberry Street

Below Elevation 280

425 feet of Oakhill Street
100 feet of Cranberry Street

Geologic
Conditions:

The right abutment is thin englacial drift or till underlain by grey schist. The left abutment is outwash sand and gravel with possible grey schist in the core of the abutment. Depth to bedrock in the foundation is not known but may be 25 to 30 feet. There are leakage problems in the left abutment and possibly in the foundation. Impervious borrow material for dam construction is available on site; however, it contains cobbles and boulders. Waterholding capabilities appear poor to good depending on a possible cut-off.

Engineering
Notes:

The recommended location for an emergency spillway is at the left abutment.

SITE NA-1109

Location: On Sucker Brook approximately 100 feet upstream from Blood Street in Pepperell, Massachusetts.

SITE NA-1109 (Cont'd)

Pepperell, Massachusetts Quadrangle

Latitude: $42^{\circ}40'20''$ Longitude: $71^{\circ}36'42''$

Remarks:

Drainage Area: 116 Acres

This site was eliminated from further study because of high damage to facilities.

Woodlawn Cemetery, roads and new subdivisions are affected.

SITE NA-1110

Location:

On Sucker Brook approximately 1700 feet downstream from Oak Hill Street in Pepperell, Massachusetts.

Pepperell, Massachusetts Quadrangle

Latitude: $42^{\circ}41'13''$ Longitude: $71^{\circ}36'37''$

Facilities

Affected:

Below Elevation 280

5 houses

4 barns

425 feet of Sartelle St.

2400 feet of Oak Hill St.

Below Elevation 270

4 houses

3 barns

425 feet of Sartelle St.

2400 feet of Oak Hill St.

Below Elevation 260

1 house

2 barns

1000 feet of Sartelle Street

1380 feet of Oak Hill Street

Geologic

Conditions:

Both abutments are outwash sand or gravel.

Depth to schist bedrock in the foundation is not known but may be 40 to 50 feet.

There are leakage problems in both abutments and possibly in the foundation. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear poor.

Engineering

Notes:

The recommended location for an emergency spillway is on the left abutment.

SITE NA-1111

Location: On Nissitissit River approximately 1900 feet upstream from Prescott Street in Pepperell, Massachusetts.

Pepperell, Massachusetts Quadrangle

Latitude: $42^{\circ}41'36''$ Longitude: $71^{\circ}35'56''$

Remarks: Drainage Area: 55 square miles
This site does not meet criteria for this study due to size of contributing drainage area. (Drainage area larger than 50 square miles); therefore, no further investigations were made.

SITE NA-1112

Location: On a tributary to Nissitissit River at a side road extending from Elliott Street in Pepperell, Massachusetts.

Pepperell, Massachusetts Quadrangle

Latitude: $42^{\circ}41'17''$ Longitude: $71^{\circ}34'34''$

Remarks: This site did not meet criteria for this study due to the small contributing drainage area, (170 acres). Therefore, no further investigations were made.

SITE NA-1113

Location: On a tributary to Sucker Brook approximately 1700 feet upstream from Dow Street in Pepperell, Massachusetts.

Pepperell, Massachusetts Quadrangle

Latitude: $42^{\circ}42'08''$ Longitude: $71^{\circ}34'18''$

SITE NA-1113 (Cont'd)

Remarks: This site did not meet criteria for this study due to the small contributing drainage area. (145 acres). Therefore, no further investigations were made.

SITE NA-1114

Location: On Unkety Brook approximately 250 feet downstream from River Street in Dunstable, Massachusetts.

Pepperell, Massachusetts Quadrangle

Latitude: $42^{\circ}41'24''$ Longitude: $71^{\circ}32'55''$

Remarks: Drainage Area: 4400 acres
This site was eliminated from further study due to high facility damage and limited storage. The Boston and Maine Railroad crosses the pool area.

SITE NA-1115

Location: On Unkety Brook approximately 1900 feet upstream from River Street in Dunstable, Massachusetts.

Pepperell Massachusetts Quadrangle

Latitude: $42^{\circ}41'24''$ Longitude: $71^{\circ}32'44''$

Remarks: Drainage Area: 4276 acres
This site does not meet criteria for this study. At maximum top of dam elevation, water depth is less than 7 feet. No further investigations were made at this site.

SITE NA-1116

Location: On tributary to Unkety Brook approximately 1500 feet from confluence with Unkety Brook in Dunstable, Massachusetts.

Pepperell, Massachusetts Quadrangle

Latitude: $42^{\circ}40'51''$ Longitude: $71^{\circ}32'08''$

Remarks: This site did not meet criteria for this study due to the small contributing drainage area, (270 acres). Therefore, no further investigations were made.

SITE NA-1117

Location: On Unkety Brook approximately 500 feet upstream from Cowell Road in Dunstable, Massachusetts.

Pepperell, Massachusetts Quadrangle

Latitude: $42^{\circ}40'04''$ Longitude: $71^{\circ}31'55''$

Facilities Affected:

<u>Below Elevation 210</u>	<u>Below Elevation 205</u>
9 houses	7 houses
6 barns	4 barns
18 wooden power poles	13 wooden power poles
2000 feet of Groton Street	1850 feet of Groton Street

<u>Below Elevation 200</u>
1 house
1 barn
7 wooden power poles
1100 feet of Groton Street

Geologic Conditions: Both abutments are outwash sand and gravel. Depth to schist bedrock in the foundation is not known, but may be 40 to 50 feet. There are leakage problems in both abutments and possibly in the foundation. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear poor.

SITE NA-1117 (cont'd)

Engineering

Notes:

The recommended location for an emergency spillway is at the right abutment.

SITE NA-1118

Location:

On Reedy Meadow Brook 2300 feet upstream from Route 113 in Pepperell, Massachusetts.

Pepperell, Massachusetts Quadrangle

Latitude: $42^{\circ}39'39''$ Longitude: $71^{\circ}34'00''$

Facilities

Affected:

Below Elevation 230

1 house

1 barn

800 feet of Nashua Road

1800 feet of Longley Street-Groton Street

Geologic

Conditions:

The right abutment is a sand and gravel esker. The left abutment is thin glacial till underlain by schist bedrock. Depth to schist bedrock in the foundation is not known, but may be 40 to 50 feet. There is a leakage problem in the right abutment. Impervious borrow material for dam construction is available on site; however, it contains cobbles and boulders. Waterholding capabilities appear poor. The esker on the right abutment is silty where checked, but probably has high permeable zones.

Engineering

Notes:

The recommended location for an emergency spillway is at the left abutment.

SITE NA-1119

Location: On James Brook approximately 300 feet upstream
from Route 111-125 in Ayer, Massachusetts.

Ayer, Massachusetts Quadrangle

Latitude: 42°34'44" Longitude: 71°35'15"

Facilities

Affected: This site has been eliminated from further study
due to excessive diking required and
many houses affected.

Geologic

Conditions: Both abutments are poorly graded sand and
gravel outwash swampy along the stream. Depth
to phyllite or schist bedrock in the foundation
is not known but may be 15 to 25 feet.
There are leakage problems in both abutments.
Impervious borrow material for dam construction
was not located on site. Waterholding capabilities
appear poor.

Engineering

Notes: The recommended location for an emergency
spillway is at the right abutment.

SITE NA-1120

Location: On James Brook approximately 300 feet
upstream from Shirley Road in Ayer,
Massachusetts.

Ayer, Massachusetts Quadrangle

Latitude: 42°34'52" Longitude: 71°35'51"

Facilities

Affected: This site was eliminated from further study
due to excessive dam length and facilities
affected.

SITE NA-1120 (Cont'd)

Geologic
Conditions:

The left abutment is poorly graded sand and gravel outwash with swamp at low elevations. The right abutment is silty sand glacial till at the top of the abutment and outwash and swamp at lower elevations. Depth to granite or schist bedrock in the foundation is not known but may be 15 to 25 feet. There are leakage problems in both abutments and the foundation. Impervious borrow material for dam construction is available on site; however, rock greater than 6 inches may run 25 to 30 percent. Waterholding capabilities appear poor.

Engineering
Notes:

The recommended location for an emergency spillway is at the right abutment.

SITE NA-1121

Location:

On a tributary to James Brook approximately 450 feet upstream from the Boston and Maine Railroad in Ayer, Massachusetts.

Ayer, Massachusetts Quadrangle

Latitude: 42°34'21" Longitude: 71°34'52"

Remarks:

This site did not meet criteria for this study due to the small contributing drainage area, (224 acres). Therefore, no further investigations were made.

SITE NA-1122

Location:

On Gulf Brook approximately 800 feet downstream from Lawrence Street in Pepperell, Massachusetts.

Townsend, Massachusetts Quadrangle

SITE NA-1122 (cont'd)

Latitude: 42°41'53" Longitude: 71°38'08"

Facilities

Affected:

Below Elevation 285

3 houses

550 feet of Oak Hill Street

600 feet of Chestnut Street

3800 feet of Lawrence Street

Below Elevation 280

2 houses

400 feet of Oak Hill St.

600 feet of Chestnut St.

3800 feet of Lawrence St.

Below Elevation 275

1 house

600 feet of Chestnut Street

3800 feet of Lawrence Street

Geologic

Conditions:

Both abutments are ice contact sand and gravel and cobbles. There could possibly be bedrock or glacial till core in the hills. There are till outcrops high on the right abutment. Depth to schist bedrock in the foundation is not known but may be 35 to 40 feet. There are leakage problems in both abutments and the foundation. Impervious borrow material for dam construction was not located on site. Water-holding capabilities appear poor.

Engineering

Notes:

The recommended location for an emergency spillway is at the left abutment.

SITE NA-1123

Location:

On Nissitissit River approximately 5000 feet upstream from Hollis Street in Pepperell, Massachusetts.

Pepperell, Massachusetts Quadrangle

Latitude: 42°41'13" Longitude: 71°35'16"

Remarks:

Drainage Area: 57 square miles
This site does not meet criteria for this study. The contributing drainage area is larger than 50 square miles. No further investigations were made.

SITE NA-1124

Location: At outlet end of marsh area near Wattles
Pond approximately 100 feet upstream
from Boston and Maine Railroad in Groton,
Massachusetts.

Pepperell, Massachusetts Quadrangle

Latitude: $42^{\circ}38'51''$ Longitude: $71^{\circ}34'38''$

Remarks: This site did not meet criteria for this study
due to the small contributing drainage area,
(155 acres). Therefore, no further investigations
were made.

SITE NA-1126 -- HEALD POND

Location: On Gulf Brook at Heald Street in
Pepperell, Massachusetts.

Townsend, Massachusetts Quadrangle.

<u>Surface Area</u> <u>(Acres)</u>	<u>Height of</u> <u>Dam (Ft.)</u>	<u>Drainage</u> <u>(Acres)</u>	<u>Area</u> <u>(Sq. Mi.)</u>
22	6	315	0.5

Potential
for
Expansion:

Could be expanded by raising Heald Street.

Remarks:

This is a small concrete and stone structure
at the Heald Street road culvert. Weir
notch is about 18-inches wide and 18-inches
deep. Spillway is in poor condition.



SITE NA-1127 -- COON TREE POND

Location: Between Townsend Street and Jewett
Street in Pepperell, Massachusetts.

Townsend, Massachusetts Quadrangle.

<u>Surface Area</u> <u>(Acres)</u>	<u>Height of</u> <u>Dam (Ft.)</u>	<u>Drainage Area</u> <u>(Acres) (Sq. Mi.)</u>	
35	3	190	0.3

Potential
for
Expansion: Expansion is possible, but the drainage
area is quite small. Dikes would be
required at both ends of the pond.

Remarks: This is a shallow flooded area with
exposed tree trunks in the pond. There
is an earth dam, but no constructed
spillway. Flows pass over a low area
of the dam. Structure is in poor
condition.

SUMMARY DATA FOR POTENTIAL UPSTREAM RESERVOIR SITES

STUDY AREA-NASHUA RIVER										SUBWATERSHED-NASHUA RIVER									
BENEFICIAL POOL										EMERGENCY SPILLWAY									
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SUMMARY DATA FOR POTENTIAL UPSTREAM RESERVOIR SITES

STUDY AREA-NASHUA RIVER										SUBWATERSHED-NASHUA RIVER									
BENEFICIAL POOL										EMERGENCY SPILLWAY									
										DESIGN HIGH WATER									
										DAM									
ELEV	STORAGE	PER AC FT	AREA (AC)	SURF AC	DEPTH AT DAM	CREST ELEV	STORAGE AT CREST	COST PER AC FT		ELEV	AREA	TOP ELEV	HGT VOL	FILL PERCENT	AT 95 YIELD	SAFE			
(MSL)	AC FT IN	(\$)	(AC)		(FT)	(MSL)	AC FT IN	(\$)		(MSL)	(AC)	(MSL)	FT CY	(MGD)					
DA= 2.10 SQ MI = 1344 AC USGS QUAD- TOWNSEND MASS LATITUDE 42-41-30 LONGITUDE 71-37-47																			
SITE RATING (3) STREAM WATER QUALITY (B) 100-YR PRIN SPWY DESIGN STORM RUNOFF = 8.10 IN, PEAK FLOW = 366 CFS																			
259.7	0	0.0	9		3.8	*	274.2 E	465	4.1	2680	*	276.7	59	*	279.7	24			
265.5	100	0.8	13040	26	49680	9.5	*	276.0 E	560	5.0	2330	*	278.4	64	*	281.4	25		
275.6	524	4.6	2700	56	25300	19.6	*	280.1 E	818	7.3	1730	*	282.6	77	*	284.9	29		
284.7	1160	10.3	1330	85	18280	28.7	*	287.2 E	1401	12.5	1110	*	289.7	102	*	291.9	36		
292.5	1924	17.2	930	114	15650	36.5	*	295.0 E	2238	20.0	800	*	297.2	137	*	299.7	44		

NA-1110 DA= 2.40 SQ MI = 1536 AC USGS QUAD- PEPPERELL MASS LATITUDE 42-41-13 LONGITUDE 71-36-37																			
SITE RATING (3) STREAM WATER QUALITY (B) 100-YR PRIN SPWY DESIGN STORM RUNOFF = 8.10 IN, PEAK FLOW = 419 CFS																			
240.6	0	0.0	12		2.5	*	253.7 E	531	4.1	1570	*	256.2	74	*	258.7	21			
245.2	100	0.8	8230	31	26330	7.3	*	251.7 E	411	3.2	2000	*	254.2	67	*	256.0	18		
251.6	378	3.0	2380	57	15890	13.6	*	256.1 E	687	5.4	1310	*	258.6	83	*	260.2	22		
255.8	656	5.1	1450	73	13080	17.9	*	258.4 E	869	6.8	1100	*	260.9	93	*	262.5	24		
260.9	1073	8.3	1000	93	11510	22.9	*	263.4 E	1337	10.3	800	*	265.9	119	*	267.7	30		
262.5	1226	9.6	910	101	11080	24.5	*	265.0 E	1509	11.8	740	*	267.4	126	*	269.4	31		

NA-1117 DA= 4.80 SQ MI = 3072 AC USGS QUAD- PEPPERELL MASS LATITUDE 42-40-04 LONGITUDE 71-31-55																			
SITE RATING (3) STREAM WATER QUALITY (B) 100-YR PRIN SPWY DESIGN STORM RUNOFF = 8.10 IN, PEAK FLOW = 837 CFS																			
184.7	0	0.0	25		2.7	*	196.0 E	1062	4.1	1260	*	198.5	223	*	201.3	19			
187.3	100	0.4	14690	49	29800	5.4	*	197.8 E	1428	5.6	1030	*	200.3	256	*	205.5	23		
191.8	423	1.7	3620	106	14510	9.8	*	198.3 E	1525	6.0	1000	*	200.8	264	*	204.3	22		
196.3	1070	4.1	1610	184	9380	14.2	*	200.8 E	2115	8.3	820	*	203.2	305	*	206.7	25		
200.7	2041	8.0	940	261	7350	18.7	*	203.2 E	2786	10.8	690	*	205.6	345	*	208.2	26		
202.5	2550	10.0	790	292	6930	20.5	*	205.0 E	3373	13.2	600	*	207.2	374	*	210.0	28		

NOTES - (1) COSTS ARE BASED ON 1971 S.C.S. DESIGN CRITERIA AND COST DATA.																			
(2) EMERGENCY SPILLWAY STORAGE AND COSTS ARE BASED ON TOTAL STORAGE, INCLUDING BENEFICIAL POOL.																			
(3) EMERGENCY SPILLWAY TYPE CODE- C=CONCRETE CHUTE, D=CONCRETE DROP, E=EXCAVATED, T= TWO SPILLWAYS, N= NONE																			
(4) TABULAR DATA ARE BASED ON PRELIMINARY INFORMATION. FIGURES SHOWN ARE PRIMARILY FOR COMPARISON PURPOSES.																			
(5) ELEVATIONS ARE SHOWN TO THE NEAREST 0.1 FOOT TO SHOW VARIATION BETWEEN DEVELOPMENTS ONLY, AND ARE NOT TO BE CONSIDERED ACCURATE TO THAT DEGREE.																			

DO NOT USE FOR FINAL SITE SELECTION OR LAND ACQUISITION.

SUMMARY DATA FOR POTENTIAL UPSTREAM RESERVOIR SITES

STUDY AREA-NASHUA RIVER

SUBWATERSHED-NASHUA RIVER

BENEFICIAL POOL

EMERGENCY SPILLWAY

DESIGN

DAM

SAFE

YIELD

ELEV	STORAGE	PER	COST	AREA	SURF	DEPTH	CREST	STORAGE	COST	TOP	HGT	FILL	PERCENT
(MSL)	AC FT	IN	(\$)	(AC)	(AC)	(FT)	(MSL)	AC FT	IN	(MSL)	ET	CY	(MGD)
						DAM	++	TYPE	AC FT	*	*	(1000	*
										ELEV	AREA	VOL	*CHANCE
										PER			

DA= 1.50 SQ MI = 960 AC USGS QUAD- PEPPERELL MASS LATITUDE 42-39-39 LONGITUDE 71-34-00

STREAM WATER QUALITY (B) 100-YR PRIN SPHY DESIGN STORM RUNOFF = 8.10 IN, PEAK FLOW = 262 CFS

192.6	0	0.0	5	4.6	*	209.0	E	332	4.1	1780	*	211.3	53	*	214.1	26	55	*	*****		
202.0	100	1.2	5570	20	27870	14.0	*	204.5	E	171	2.0	3250	*	207.0	37	*	208.3	20	33	*	0.25
207.2	250	3.0	2560	38	16800	19.2	*	209.7	E	368	4.6	1750	*	212.2	55	*	213.7	26	53	*	0.43
213.3	551	6.8	1410	59	13130	25.4	*	215.8	E	723	9.0	1080	*	218.2	76	*	220.2	32	89	*	0.70
219.8	1002	12.5	990	81	12260	31.9	*	222.3	E	1267	15.7	790	*	224.7	148	*	228.2	40	149	*	0.94
222.5	1270	15.8	870	116	9490	34.5	*	225.0	E	1616	20.2	680	*	226.6	173	*	229.7	42	164	*	1.05
*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	

NA-1118 DA= 1.10 SQ MI = 704 AC USGS QUAD- TOWNSEND MASS LATITUDE 42-41-53 LONGITUDE 71-38-08

STREAM WATER QUALITY (B) 100-YR PRIN SPHY DESIGN STORM RUNOFF = 8.10 IN, PEAK FLOW = 192 CFS

233.0	0	0.0	5	3.0	*	247.8	E	243	4.1	3540	*	250.2	26	*	253.0	23	35	*	*****		
241.3	100	1.7	8540	18	47830	11.3	*	243.8	E	156	2.7	5470	*	246.3	22	*	247.8	18	21	*	0.23
253.1	373	6.4	2760	31	33410	23.1	*	255.6	E	464	7.8	2220	*	258.0	39	*	259.7	30	59	*	0.49
263.4	783	13.3	1540	49	24720	33.4	*	265.9	E	920	15.7	1310	*	268.2	58	*	270.5	40	114	*	0.71
272.7	1330	22.7	1050	68	20340	42.8	*	275.2	E	1515	25.7	920	*	277.7	81	*	280.4	50	182	*	0.88
274.7	1467	25.0	980	73	19690	44.8	*	277.2	E	1667	28.4	870	*	279.7	85	*	282.7	53	203	*	0.92
*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	

-289-

NA-1122 DA= 1.10 SQ MI = 704 AC USGS QUAD- TOWNSEND MASS LATITUDE 42-41-53 LONGITUDE 71-38-08

STREAM WATER QUALITY (B) 100-YR PRIN SPHY DESIGN STORM RUNOFF = 8.10 IN, PEAK FLOW = 192 CFS

(3)	EMERGENCY SPILLWAY TYPE CODE- C=CONCRETE CHUTE, D=CONCRETE DROP, E=EXCAVATED, T= TWO SPILLWAYS, N= NONE
(4)	TABULAR DATA ARE BASED ON PRELIMINARY INFORMATION. FIGURES SHOWN ARE PRIMARILY FOR COMPARISON PURPOSES.
(5)	ELEVATIONS ARE SHOWN TO THE NEAREST 0.1 FOOT TO SHOW VARIATION BETWEEN DEVELOPMENTS ONLY, AND ARE NOT TO BE CONSIDERED ACCURATE TO THAT DEGREE

NOTES - (1) COSTS ARE BASED ON 1971 S.C.S. DESIGN CRITERIA AND CCST DATA.

(2) EMERGENCY SPILLWAY STORAGE AND COSTS ARE BASED ON TOTAL STORAGE, INCLUDING BENEFICIAL POOL.

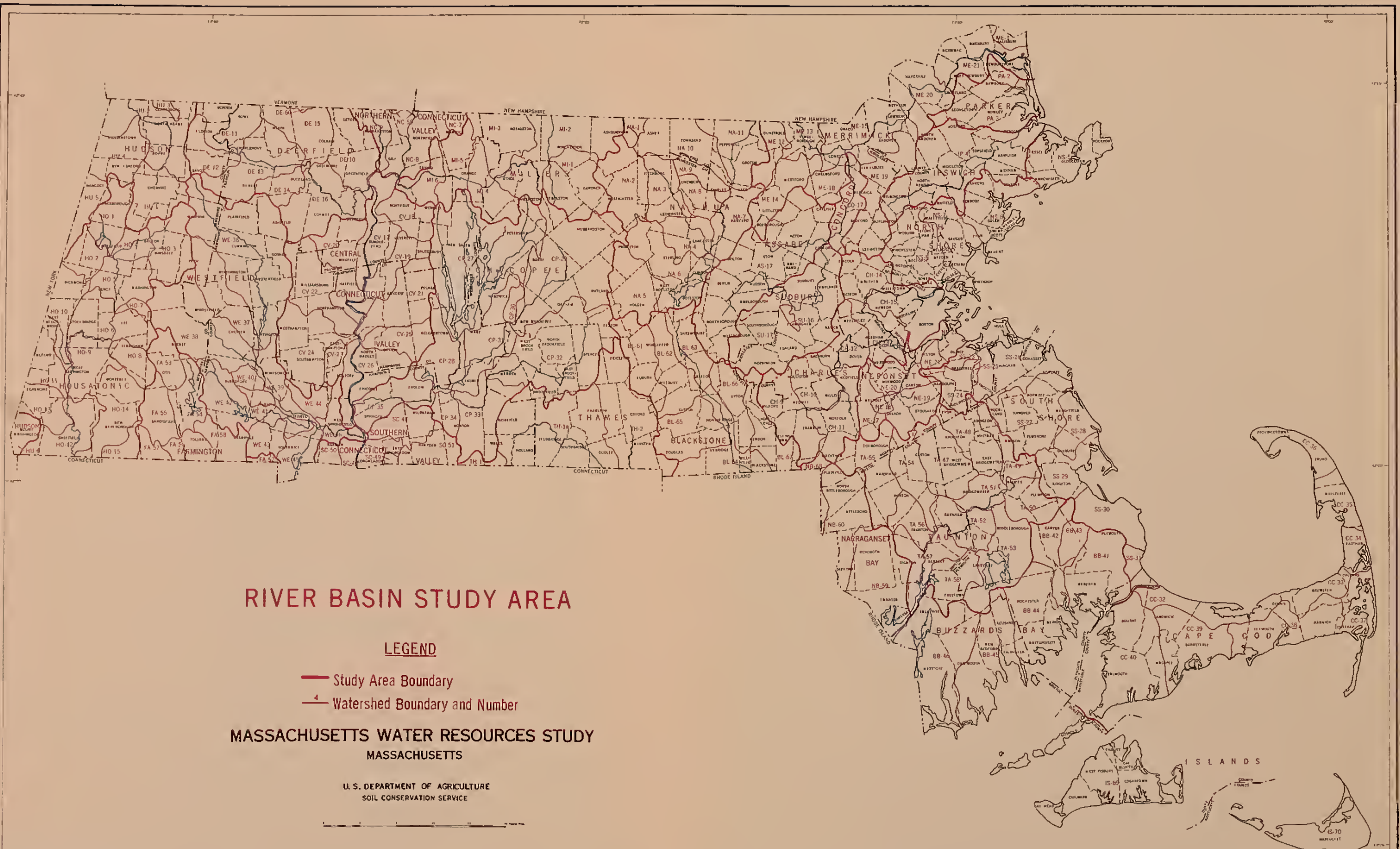
(3) EMERGENCY SPILLWAY TYPE CODE- C=CONCRETE CHUTE, D=CONCRETE DROP, E=EXCAVATED, T= TWO SPILLWAYS, N= NONE

(4) TABULAR DATA ARE BASED ON PRELIMINARY INFORMATION. FIGURES SHOWN ARE PRIMARILY FOR COMPARISON PURPOSES.

(5) ELEVATIONS ARE SHOWN TO THE NEAREST 0.1 FOOT TO SHOW VARIATION BETWEEN DEVELOPMENTS ONLY, AND ARE NOT TO BE CONSIDERED ACCURATE TO THAT DEGREE.

** DO NOT USE FOR FINAL SITE SELECTION OR LAND ACQUISITION. **

NOTES



RIVER BASIN STUDY AREA

LEGEND

- Study Area Boundary
- Watershed Boundary and Number

MASSACHUSETTS WATER RESOURCES STUDY MASSACHUSETTS

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE



JULY 1971

Map made in accordance with the Cartographic Standards for Government Service, 1964.
Map scale: 1:750,000. Scale, 1 inch equals 12.5 miles. 1 inch equals 20.1 kilometers.
Map made by the Massachusetts Department of Conservation and Recreation, 1971.



APPENDIX 1

MUNICIPAL INDEX OF SITES

<u>City or Town</u>	<u>Site No.</u>	<u>Narrative Information</u>	<u>Design Summary</u>
		<u>Page</u>	<u>Page</u>
Ashburnham	0104	10	18
	0105	11	18
	0106	11	--
	0109	13	19
	0110	15	--
	0111	16	--
	0112	16	--
	0113	16	--
	0202	22	55
	0203	22	55
	0204	23	55
	0205	24	56
	0219	33	58
	0225	36	59
	0226	38	--
	0233	44	--
	0243	54	--
Ashby	0101	7	17
	0102	8	17
	0103	9	17
	0107	12	18
	0108	13	19
	1001	243	264
	1002	244	264
	1003	245	--
	1004	246	264
	1005	246	265
	1019	256	267
	1020	257	268
	1021	258	268
	1022	259	--
	1024	260	269
	1025	261	--
Ayer	0711	190	--
	0720	197	--
	0721	198	--
	0722	199	--
	0723	200	--
	0724	201	--
	1119	281	--
	1120	281	--
	1121	282	--

<u>City or Town</u>	<u>Site No.</u>	<u>Narrative</u> <u>Information</u>	<u>Design</u> <u>Summary</u>
		<u>Page</u>	<u>Page</u>
Bolton	0418	96	--
	0701	183	202
	0702	184	202
	0715	193	204
	0716	193	205
Boylston	0632	166	--
	0633	167	180
	0634	167	181
Clinton	0620	157	178
	0621	158	178
	0637	171	--
	0638	172	--
Dunstable	1114	278	--
	1115	278	--
	1116	279	--
	1117	279	288
Fitchburg	0208	25	--
	0228	40	60
	0238	49	--
	0239	50	--
	0242	53	--
	0301	61	82
	0302	62	--
	0303	62	--
	0304	63	82
	0305	63	--
	0306	64	--
	0310	67	--
	0318	73	83
	0321	76	--
	0322	77	--
	0324	79	--
	0325	80	--
Gardner	0201	21	--
	0209	26	--
	0218	32	58
	0229	40	60
Groton	1023	259	268
	1124	284	--

<u>City or Town</u>	<u>Site No.</u>	<u>Narrative</u>	<u>Design</u>
		<u>Information</u>	<u>Summary</u>
		<u>Page</u>	<u>Page</u>
Harvard	0702	184	202
	0703	185	202
	0704	186	--
	0709	188	203
	0710	189	--
	0719	196	--
Holden	0509	110	135
	0510	111	--
	0511	111	135
	0512	112	--
	0513	113	136
	0514	113	136
	0515	114	136
	0516	115	--
	0517	116	137
	0519	117	137
	0520	118	--
	0521	119	--
	0522	119	--
	0523	119	138
	0524	120	--
	0525	121	138
	0526	122	138
	0528	123	--
	0531	126	--
	0532	127	--
	0533	128	--
	0534	129	--
	0535	130	--
	0537	132	--
	0538	132	--
Lancaster	0412	93	--
	0415	94	--
	0416	95	102
	0417	95	--
	0419	96	103
	0420	97	--
	0421	98	103
	0629	164	180
	0705	186	203
	0706	187	--
	0707	187	203
	0708	188	--
	0714	192	204
	0717	194	205
	0813	216	--
	0815	217	228
	0818	219	228
	0821	222	--
	0824	225	--

<u>City or Town</u>	<u>Site No.</u>	<u>Narrative</u>	<u>Design</u>
		<u>Information</u>	<u>Summary</u>
		<u>Page</u>	<u>Page</u>
Leominster	0217	31	57
	0240	51	--
	0311	68	--
	0312	68	--
	0313	68	--
	0314	69	--
	0315	70	--
	0316	71	--
	0317	72	--
	0319	74	--
	0320	75	--
	0323	78	--
	0327	81	--
	0401	85	--
	0402	86	--
	0403	87	101
	0413	93	--
	0422	99	--
	0423	100	--
	0626	161	179
	0636	170	--
	0805	210	226
Lunenburg	0307	64	82
	0308	66	--
	0309	67	83
	0326	81	--
	0801	207	--
	0802	208	--
	0803	209	226
	0804	209	--
	0806	211	--
	0807	213	226
	0808	213	227
	0811	215	--
	0812	216	227
	0819	220	229
	0820	221	--
	0822	223	--
	0823	224	--
	0901	231	239
	0902	232	239
	0903	233	--
	0907	236	240
	0908	236	241
	0909	238	--
Paxton	0529	124	--
	0530	125	--

<u>City or Town</u>	<u>Site No.</u>	<u>Narrative</u>	<u>Design</u>
		<u>Information</u>	<u>Summary</u>
		<u>Page</u>	<u>Page</u>
Pepperell	1101	271	
	1102	271	
	1103	272	287
	1104	273	287
	1105	273	
	1106	274	287
	1107	274	
	1108	275	288
	1109	275	
	1110	276	288
	1111	277	
	1112	277	
	1113	277	
	1118	280	289
	1122	282	289
	1123	283	
	1126	285	
	1127	286	
Princeton	0602	142	173
	0603	142	173
	0604	143	173
	0605	144	174
	0606	144	174
	0607	145	174
	0608	146	175
	0627	162	179
	0635	169	
Rutland	0506	109	
	0507	109	134
	0508	110	135
	0536	131	
Shirley	0712	191	204
	0713	192	
	0718	195	205
	0809	214	
	0810	215	227
	0816	216	228
	0817	218	
	0904	233	239
	0905	234	240
	0906	235	240
	1015	254	
	1016	254	

<u>City or Town</u>	<u>Site No.</u>	<u>Narrative</u>	<u>Design</u>
		<u>Information</u>	<u>Summary</u>
		<u>Page</u>	<u>Page</u>
Sterling	0404	87	--
	0405	88	--
	0406	89	--
	0407	89	101
	0408	90	--
	0409	91	--
	0410	91	102
	0411	92	102
	0414	94	--
	0609	148	--
	0610	149	175
	0611	150	175
	0612	151	176
	0613	152	--
	0614	152	176
	0615	153	176
	0616	154	177
	0619	159	--
	0622	159	178
	0623	159	--
	0624	160	--
	0628	163	179
	0630	165	180
	0631	166	--
Townsend	1006	247	265
	1007	248	--
	1008	249	265
	1009	249	--
	1010	250	--
	1011	250	266
	1012	251	--
	1013	253	266
	1014	253	266
	1017	255	267
	1018	255	267
	1026	262	--
	1027	263	--
Westminster	0206	24	--
	0207	25	--
	0210	26	56
	0211	27	--
	0212	27	--
	0213	28	56
	0214	30	57
	0215	30	--
	0216	31	57
	0220	33	--
	0221	34	58
	0222	35	59
	0223	35	--
	0224	36	59

<u>City or Town</u>	<u>Site No.</u>	<u>Narrative Information</u>	<u>Design Summary</u>
		<u>Page</u>	<u>Page</u>
Westminster	0227	39	59
	0230	41	--
	0231	42	--
	0232	43	--
	0234	45	--
	0235	46	--
	0236	47	--
	0237	48	--
	0241	52	--
	0601	141	--
West Boylston	0518	117	137
	0617	155	177
	0618	156	177
	0625	161	--

Appendix - 2

OWNERSHIP AND USE OF EXISTING SITES

The following information details the ownership and use of the existing reservoirs in the Nashua Study Area. The data were obtained from records maintained by the Massachusetts Department of Public Works, Division of Waterways.

<u>Site Number</u>	<u>Name</u>	<u>Apparent Owner</u>	<u>Present Use</u>
0110	Marble Pond	Mrs. Oscar L. Marble	Private
0213	Burnt Mill Pond	Westminster Sportsmans' Club, Inc. Westminster, Mass.	Fishing
0226	Lake Wamanoag	Weyerhaeuser, Inc. Fitchburg, Mass.	Storage
0227	South Ashburnham Reservoir	Weyerhaeuser, Inc. Fitchburg, Mass.	Storage
0230	Meetinghouse Pond	City of Fitchburg, Mass. Water Dept.	Water Supply
0231	Crocker Pond	Weyerhaeuser, Inc. Fitchburg, Mass.	Storage
0232	Wachusett Lake	City of Fitchburg, Mass. Water Dept.	Water Supply
0233	Winnekeag Lake	Weyerhaeuser, Inc. Fitchburg, Mass.	Storage
0234	Factory Village Pond	Weyerhaeuser, Inc. Fitchburg, Mass.	Storage
0235	Round Meadow Pond	Weyerhaeuser, Inc. Fitchburg, Mass.	Storage
0236	Partridge Pond	Town of Westminster, Mass.	Storage
0237	Wyman Pond	City of Fitchburg, Mass. Water Dept.	Recreation

<u>Site Number</u>	<u>Name</u>	<u>Apparent Owner</u>	<u>Present Use</u>
0238	Snowsmill Pond	Weyerhaeuser, Inc. Fitchburg, Mass.	Mill Pond
0239	Sawmill Pond	Weyerhaeuser, Inc. Fitchburg, Mass.	Storage
0240	Crow Hill Pond	Commonwealth of Massachusetts	State Park Recreation
0241	Crocker Pond	Weyerhaeuser, Inc. Fitchburg, Mass.	Storage
0242	MacTaggart's Pond	Weyerhaeuser, Inc. Fitchburg, Mass.	Storage
0308	Old Pages Pond	Fiske R. Jones	Private
0315	Haynes Reservoir	City of Leominster, Mass.	Water Supply
0317	Notown Reservoir	City of Leominster, Mass.	Water Supply
0319	Pierce Pond	Fitchburg Realty Corp. Mass.	Storage
0320	Rockwell Pond	Jafal Corporation Leominster, Mass.	Mill Pond
0321	Overlook Reservoir	City of Fitchburg, Mass. Water Dept.	Water Supply Distribution Resv.
0322	Green's Pond	Charles H. Greene Ice Co., Fitchburg, Mass.	
0323	Morse Reservoir	City of Leominster, Mass.	Water Supply
0324	Lovell Reservoir	City of Fitchburg, Mass. Water Dept.	Water Supply
0325	Scott Reservoir	City of Fitchburg, Mass. Water Dept.	Water Supply
0402	Leominster Recreation Area	City of Leominster, Parks Department	Recreation

<u>Site Number</u>	<u>Name</u>	<u>Apparent Owner</u>	<u>Present Use</u>
0405	Heywood Reservoir	Town of Clinton, Mass. Water Dept.	Water Supply
0422	Fall Brook Reservoir	City of Leominster, Mass. Water Dept.	Water Supply
0423	Lake Samoset	Lake Samoset Property Owners Association Leominster, Mass.	Recreation
0520	Pine Hill Reservoir	City of Worcester, Mass. Water Dept.	Water Supply
0528	Quinapoxet Reservoir	City of Worcester, Mass. Water Dept.	Water Supply
0529	Asnebumskit Pond	Town of Paxton, Mass. Water Dept.	Water Supply
0530	Streeter Pond	Mr. Al David Paxton, Mass.	Private
0531	Kendall Reservoir	City of Worcester, Mass. Water Dept.	Water Supply
0532	Stump Pond	Duesburg & Bosson Woolen & Spinning Co. Holden, Mass.	Mill Pond
0533	Eagle Lake		
0534	Unionville Pond	Metropolitan District Commission, Boston, Mass.	
0535	Peter Carr's Pond	City of Worcester, Mass. Water Dept.	Water Supply
0536	Muschopauge Pond	Town of Holden Water Dept.	Water Supply
0609	Hycrest Farm Pond	Mr. Dino DeCarlo Sterling, Mass.	Private
0624	Stuart Pond	Mr. Walter G. Williams Sterling, Mass.	Private
0635	Paradise Pond	Commonwealth of Massachusetts	
0636	Bartlett Pond	Leominster Sportsman's Ass. Leominster, Mass.	Fishing

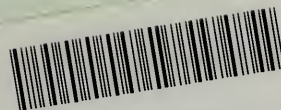
<u>Site Number</u>	<u>Name</u>	<u>Apparent Owner</u>	<u>Present Use</u>
0637	Wachusett Reservoir	Metropolitan District Commission, Boston, Mass.	Water Supply
0638	Coachlace Pond	Standard Burner Co. Clinton, Mass.	
0719	Bare Hill Pond	Town of Harvard, Mass.	
0821	Fort Pond		Recreation
0823	Lake Whalom	Town of Lunenburg, Mass.	
0909	Hickory Hills Lake	Hickory Hills Lake Corp. Lunenburg, Mass.	Recreation
1025	Fitchburg Reservoir	City of Fitchburg, Mass. Water Dept.	Water Supply
1026	Harbor Pond	Mr. Aksila Townsend, Mass.	Private

APPENDIX-3

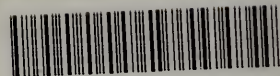
This report is one of a series dealing with potential reservoir sites. Previous similar reports are:

1. Study of Possible Water Storage Areas, Ipswich River Watershed, January 14, 1965.
2. Study of Possible Water Storage Sites, Upper Hoosic River and Upper Housatonic River, February 1966.
3. A Study of Potential Reservoir Sites in Massachusetts, Hudson River Basin, January 1968.
4. A Study of Potential Reservoir Sites, Housatonic Study Area, Massachusetts, June 1969.
5. Inventory of Potential and Existing Reservoir Sites, Merrimack Study Area, Massachusetts, March 1970.
6. Inventory of Potential Reservoir Sites, Neponset Study Area, Massachusetts, October 1970.
7. Inventory of Potential and Existing Upstream Reservoir Sites, Thames Study Area, Massachusetts, January 1971.
8. Inventory of Potential and Existing Upstream Reservoir Sites, Parker and North Shore Study Area, Massachusetts, June 1971.

Potential reservoir site studies are now in progress for the Taunton, Narragansett Bay, Deerfield, and Chicopee Study Areas. Other reports will be prepared in future years for the remainder of the state. Basic data from which this report was prepared are on file in the Soil Conservation Service Office, 29 Cottage Street, Amherst, Massachusetts 01002.



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